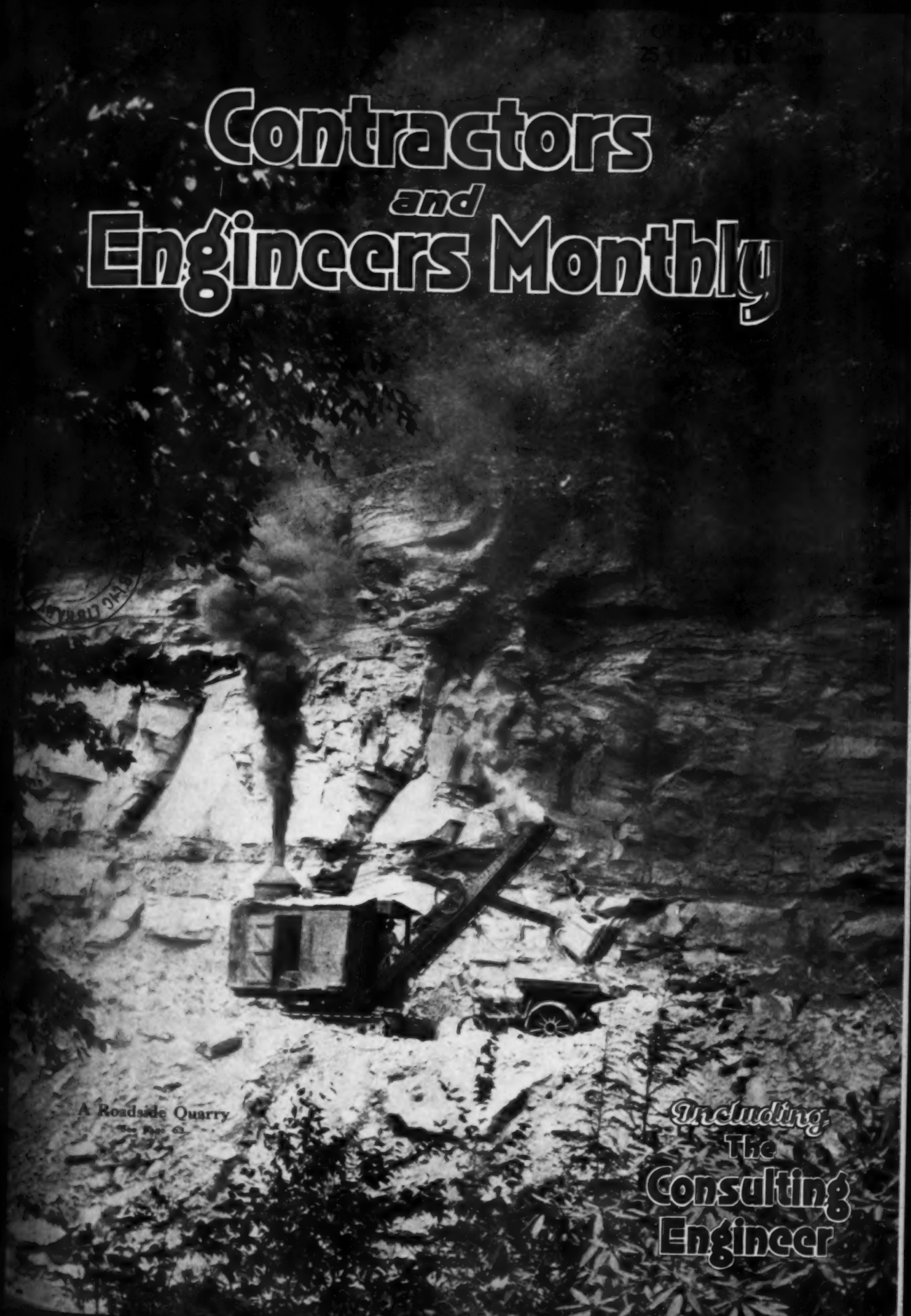
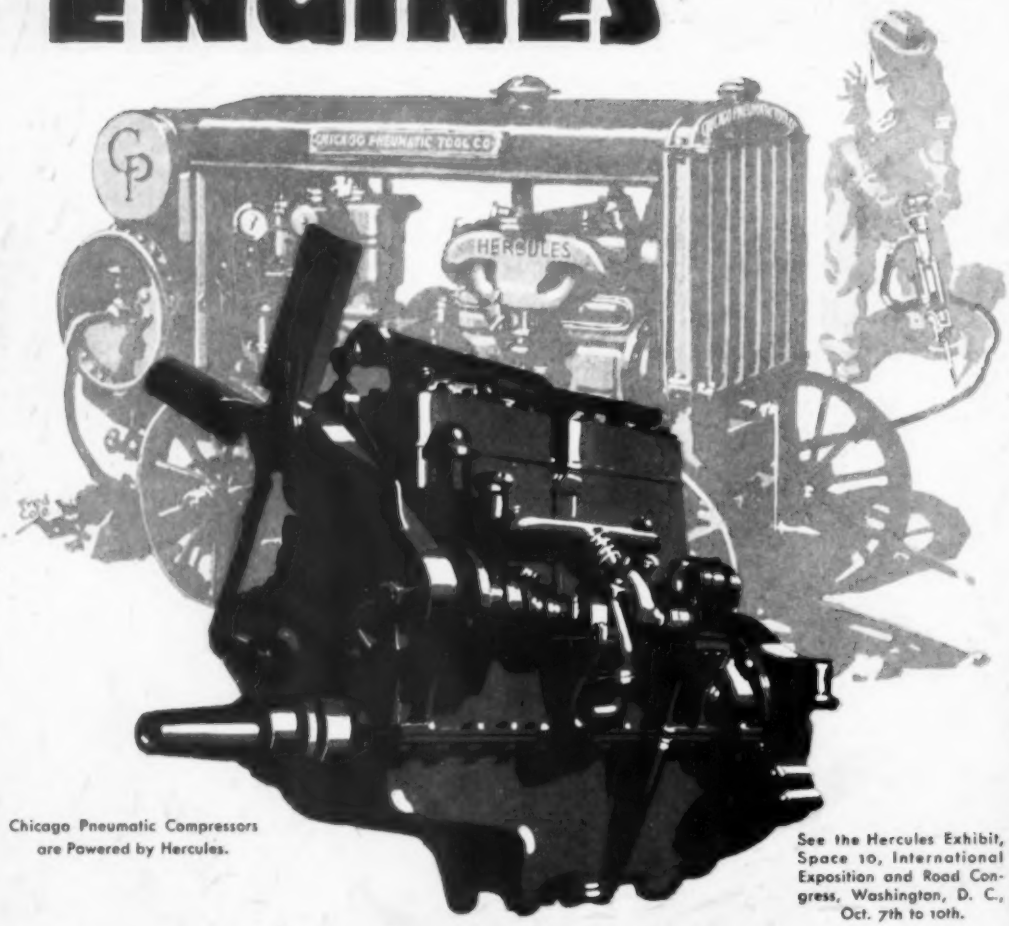
Contractors and Engineers Monthly



A Roadside Quarry

Including The Consulting Engineer

HERCULES ENGINES



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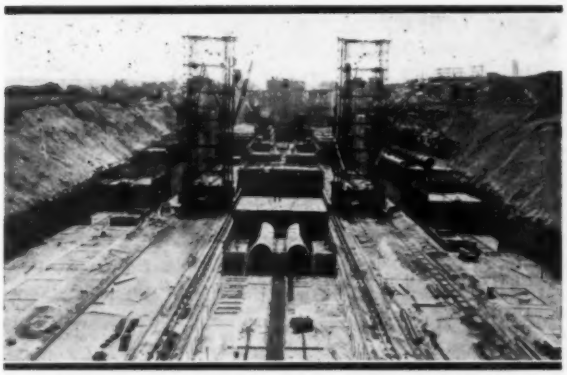
Road Construction Around the World

Influence of American Methods and Use of American Machinery in Various Countries Reported by American Consular Officials for Contractors and Engineers Monthly

ON October 6, the Sixth Congress of the Permanent International Association of Road Congresses will open its meeting in Washington, D. C. Delegations including as many as one hundred engineers are our guests from England, France, Germany and Italy, with smaller delegations from other countries, including those as far distant as China, India and Australia, and totaling at least 55 in number. In paying honor to this Congress, CONTRACTORS AND ENGINEERS MONTHLY has secured from American Consuls in all parts of the world reports on road construction and the use of American machinery in this work which it takes pleasure in presenting to its readers and to the delegates attending the Congress.

A careful study of the Consular reports shows that where labor is cheap and abundant, little machinery is used, but where economic conditions are improving, American machinery is being used to a considerable extent. American manufacturers have developed many of the markets of the world for the sale of road machinery. Perhaps some of them have not taken full advantage of the Bureau of Domestic and Foreign Commerce of the Department of Commerce at Washington, which stands ready to assist them with information on the methods of financing which are customary in foreign countries and on the best methods of approach for placing American goods in foreign markets.



Scene During the Construction of the Welland Canal on Which Nine 56-S Ransome Mixers Were Used

With the improvement of economic conditions in South America, rests the best opportunity for increased sales of American road machinery outside of the United States. There is some feeling that the present tariff may cause the creation of retributive tariffs in some European countries, but, inasmuch as English and German road machinery seem to predominate in those markets today, any change in tariff would probably have little effect upon the market as regards the sale of American equipment.

It is interesting to note that in some countries the better work of American road machinery has led to its adoption in spite of its higher cost and the intense competition of European manufactured machinery. American tractors, dredges and pneumatic equipment lead the sales and point the way for a greater development of the market for other types of construction equipment.

NORTH AMERICA

Canada

By Frank C. Lee
American Consul General
Halifax, Nova Scotia

The principal demand in Nova Scotia for road building machinery and material is from the Provincial Department of Highways at Halifax. An inventory of the equipment now owned by the Department of Highways includes the following items:

2 trucks of American manufacture, one 1-ton and one 1½-ton valued at $928.

68 tractors of American manufacture, valued at $160,699.83.

77 tractor graders, motor patrols, and maintainers, mostly of American manufacture, with 9 maintainers made in Canada, valued at $74,060.89.

Crusher and crusher equipment of Canadian and American make, valued at $43,146.25.

Oil and gas engines, mostly of Canadian manufacture, valued at $8,998.59.

6 Canadian concrete mixers valued at $1,176.75.

8 American-made air compressors purchased in 1920 and valued at $11,016.

8 steam rollers of Canadian make, valued at $2,630.

An American Grader on a Nova Scotia Highway

General equipment, including bulldozers, dredging pumps and fittings, tar kettles, tank wagons, pile hammers, orange-peel buckets, snow plows and scrapers, of both American and Canadian make, valued at $9,444.35.

Machinery at the Debert gravel pit, including pumps, buckets, elevators, screens, motors, crushers and hoists, of both American and Canadian manufacture, valued at $13,959.20.

Machinery at the Deep Hollow Crusher, where the crusher and 40-horsepower electric motor are American and the elevator, screen and dump cars of Canadian make, all valued at $2,482.60.

Machinery at the Long Island gravel pit, of both Canadian and American make, valued at $30,353.49.

Automobiles and trucks, all of American manufacture, valued at $8,206.92.

Garage equipment, mostly of American make, valued at $1,746.75.

15 motorcycles of American make, valued at $3,031.

A total of $371,880.62.

The gravel and crushed rock used in the construction of provincial highways and city and town streets are obtained locally. Paving materials other than gravel and crushed rock are to some extent imported from the United States, but only periodically and very seldom as the contracts are received by the local contractors.

During the past year the Provincial Department of Highways has begun the use of calcium chloride as a dust binder, and it has proved so successful that large quantities may be imported in the future. Up to June 27, 1930, 60 carloads of 50,000 pounds each have been imported, divided equally between England and the United States.

There were 6,506 miles of improved roads in Nova Scotia on January 1, 1929, and 567 miles were improved during that year, showing a gain of almost 9 per cent. Of the total road mileage in the Province, 7,903 miles are unimproved, and 8,073 miles are improved by either grading, grading and surfacing with gravel or grading and hard surfacing, of which there is only 17 miles.

By P. S. Heintzleman
American Consul General
Winnipeg, Manitoba

Machinery is used almost exclusively in the construction and maintenance of the highways of the Province of Manitoba, American machinery representing about 85 per cent of the total. The remaining requirements are met by Canadian manufacturers in the eastern provinces, many of which are Canadian branches of American factories.

Gasoline is the motive power for all powered machinery in this district, the machinery in general use being of the following types: gasoline-powered draglines mounted on crawlers, gasoline-powered crawler tractors, crawler-mounted all-steel dump wagons, wooden dump wagons, elevating graders, blade graders, scrapers, fresnoes and bulldozers. Conditions in this province are comparable to those in the North Central States.

Manitoba plans to enter upon an extensive highway construction and repair program which will provide all-weather roads from north to south and east to west. The more important highway work calls for the oiling of the highway south from Winnipeg to the international border at Emerson; north from the city to The Pas, which is the central city of the northern mining areas; east to complete the trans-Canada highway to connect this province with eastern Canada; and west to improve the present connection with the western provinces.

Because of the severity of the winters with resultant damage to highways through frost, together with the high per capita costs, hard-surfaced highways are not laid to any great extent. City streets are hard-surfaced. Gravel roads are quite common throughout the province, and the material for their construction is easily obtainable in the traversed districts.

The chief complaint made against American highway machinery here is one of service and repair parts. It was only during the past year that, as a result of insistent demands made upon the manufacturers and their local representatives, this deficiency has been met in part. Since highway construction work here is usually carried on at great distances from supply centers, the delays met with in securing repair parts is both exasperating and costly, and it is believed that manufacturers who have local representatives would find it to their advantage to see that an adequate supply of repair parts is maintained.

Cuba

By F. T. F. Dumont
American Consul General
Habana, Cuba

There is no demand at the present time for road building machinery in Cuba. Because of the economic depression which prevails in Cuba, no work is under construction except that of the Central Highway from Pinar del Rio to Santiago, which is being built by the Warren Brothers Co., Habana, and Boston, Mass., and the Cia. Cubana de Contratistas, Habana. It seems unlikely in the present situation that there will be any extensive demand for American road machinery in the next two or three years.

Bahama Islands

By Fred D. Fisher
American Consul
Nassau, Bahamas

Most of the road work in the Bahamas is done by the Government under the supervision of the Chief Engineer of the Colony. These islands are composed chiefly of limestone rock. There is little or no top soil, and mud conditions are rarely, if ever, encountered. Thus far, most of the road construction has consisted of merely grading and oiling, although some surface material has been used.

There is a total of approximately 140 miles of roadway on the Island of New Providence suitable for motor traffic, about 10 miles of which have been constructed during the past year. All of the asphalt used for road surfacing in the Bahamas, and 75 per cent of the machinery now in use by the Public Works Department, have been imported from the United States. A list of the American road machinery used by this Department follows:

1 8-ton Kelly-Springfield road roller
3 hand rollers
2 Hadfield-Penfield tractor-drawn rollers
1 Hadfield-Penfield grader and tractor

Construction of an Asphalt Top Roadway in Cuba

3 Fordson tractors
2 Chicago Pneumatic air compressors
2 Fairbanks-Morse centrifugal pumps
4 electric motors
2 McKiernan-Terry steam hammers
1 stone breaker
1 Ingersoll-Rand jackhammer
4 Wonder and Jaeger concrete mixers
1 Kinney sweeper
1 Kinney distributor
2 Kinney kettles
1 Reliance stone crusher
1 hand oiler
2 Novo diaphragm pumps
3 U. S. Co. and Stanley electric drills
1 Jeffrey conveyor
1 Chevrolet truck
3 GMC trucks
9 Ford turcks
2 Ford automobiles

Dominican Republic

By Reed Paige Clark
American Consul
Santo Domingo, Dominican Republic

The past year, 1929, has been a hard one for the Dominican Republic. Economic conditions have been bad and the Government has been compelled to suspend much of its constructive work, including road building. A very small mileage of new roads was built during the year and comparatively little maintenance work was carried out.

No separate statistics of Dominican origin are available to show what have been the imports of road machinery and construction machinery and materials in past years, but it is a certainty that far more than one-half of such machinery and materials has regularly come from the United States. In 1929 the United States supplied about 84 per cent of all machinery and apparatus imported into this country. At best, the local importations of machinery are small, as the country is by no means industrialized.

The following figures, covering the year 1928 show the export of certain items of road and construction machinery from the United States to the Dominican Republic:

1 power shovel
Power shovel parts valued at $7,597
6 concrete mixers
1 road roller
Other road making and construction equipment valued at $14,904

Mexico

By William P. Blocker
American Consul
Ciudad Juarez, Mexico

The only road making machinery of any kind that is known to be in use in this district at present is that which is being employed in the construction of a road from Cd. Juarez to Porvenir, consisting of two 60-horsepower tractors, two scrapers and one 15-ton roller. All of this equipment, which is estimated to have a value of $18,000, is of American manufacture and was furnished to the State of Chihuahua by the National Roads Commission in Mexico City as the Federal Government's contribution toward the construction of the new highway.

The cost of this highway is estimated to be 365,000 pesos or about $170,000, plus an additional 120,000 pesos, or about $56,000, to defray the expense of oiling. The length of the new road is 66 miles. It will eventually be extended to Chihuahua City, the State Capitol.

It is not known at present whether any additional road making equipment will be required for this work, but if any is purchased it will undoubtedly be of American manufacture. The position of this consular district along the United States border gives American products a tremendous advantage, and as far as road making machinery is concerned American manufacturers will find little or no competition.

By Dudley G. Dwyre
American Consul
Mexico City, Mexico

A great deal of interest and enthusiasm is being shown in the construction of highways in Mexico. As the various highways now under construction are completed and confidence in the stability of Mexico is restored, the presence of good roads in the Republic will give tremendous impetus toward the development of towns and villages in the heretofore remote sections.

Already various highways are being used in the Republic, particularly those leading out of Mexico City to Pachuca, Puebla and Acapulco, via Cuernavaca. The Mexico City-Nuevo Laredo section of the Pan-American Highway has become very popular with motorists from the United States who are visiting Monterrey in large numbers. Work on the uncompleted sections of this road between Colonia and Ciudad Victoria is being pushed rapidly. The National Highway Commission has formulated a program which contemplates the expenditure of 80,000,000 pesos, or about $40,000,000, during the next five years for the improvement and continuation of roads already under construction and for the building of new roads.

According to the Yearbook of the National Highway Commission, road construction and maintenance machinery in use up to the end of 1929 totaled in value over $2,000,000, U. S. currency. To give an idea of the machinery purchased by this Commission and now in use, the following items are listed:

30 12-ton road rollers
2 5-ton road rollers
25 10-ton tractors
35 2-ton tractors
24 heavy road graders
9 light road graders
5 power road graders
1 elevating grader
150 trucks
100 automobiles
50 dump cars or wagons
50 dump cars, Decauville type
10 trailers
4 steam shovels
25 compressors
18 drill sharpeners
14 oil forges for drill sharpening
90 hand drills
25 rock crushers
350 drag scrapers of various types
12 hoists
18 concrete mixers
8 road oilers

Heavy Grading and Haulage on a Mexico Highway

6 pavement patchers
17 portable light plants
2 well-drilling machines
1 diamond core drill
35 contractors' pumps

In view of the announced program of the Highway Commission and the wear and tear of the machinery already in use, it is contemplated that the Commission will purchase road building and maintenance equipment during 1930 and 1931 amounting in value to about 20 per cent of the value of the equipment already in use. From 1925 to 1929 exports of American road building equipment to Mexico totalled $985,444.

The National Highway Commission has kept abreast of the American methods of highway construction through close contact with the American Road Builders Association, and has sent students to the United States to be trained along technical lines in the use of highway machinery and highway construction.

While the economic depression in Mexico at the present time is due in a large measure to a decline in the market price of silver and a subsequent curtailment of mining activities, machinery dealers are hopeful of the future because of the present enthusiasm for the construction and improvement of highways.

By Edward S. Maney
American Vice Consul
Nogales, Mexico

The construction of modern highways such as are found in the United States is still in its infancy here. Until 1928 there had never been any effective effort made on the part of the State Government to construct highways, the then existing roads being nothing but rough wagon roads impassable in many places by automobiles. In that year work was begun on a main highway which was to connect Nogales on the international boundary with Guaymas on the Gulf of California. It was to be the first link in Mexico of an international highway extending from Los Angeles via Nogales and proceeding down the west coast of Mexico as far as Mexico City.

All highway construction was suspended during the insurrectionary movement which upset this section during the spring of 1929, but was taken up again during the summer of that year.

At the present time the State Highway Commission has three road projects under construction, a distance of 72 miles from Santa Ana to Caborca in the Altar district, 150 miles from Hermosillo to Arizpe by way of Ures, and the granting of state aid to various municipalities.

From May 15 to November 20, 1929, 157,839.48 pesos or approximately $75,000,000 was expended, which included $32,000 for highway construction machinery, consisting of two tractors of the track laying type, trucks, graders, etc., all of American manufacture.

There is no domestic or foreign made highway construction machinery, other than American, offered for sale in this district. The general high quality of American manufactured machinery is well known to local importers, and that, coupled with the proximity of this district to the United States, gives the American exporter a monopoly of the local market.

Practically all the construction work being carried on in the San Luis Potosi, Mexico, district is being done by American engineers with American machinery. In the city of San Luis Potosi quite a bit of paving is being done by an American engineer using American made machinery.

The Federal Government is building a road from Laredo to Mexico City which is to pass through the eastern part of the State of San Luis Potosi. It is understood, however, that so far no work has been undertaken within the district. There is one other road under construction at present. There is a project fostered by the State Government to connect the city of San Luis Potosi with the Laredo-Mexico City road. Work on this highway was inaugurated some time ago and has progressed slowly. As one engineer expressed it, the road will be too dusty in the dry season and will wash out in the rainy season. Nothing is being done other than grading and removing cactus.

In Aguascalientes, since 1927 the city has paved approximately 85,000 square meters of streets. In the country districts, the State has built about 105 kilometers of roads and has reconditioned about the same amount. As soon as the rainy season is over, the State government will start road building again, having in the program about 200 kilometers in view for the coming year, and inside of city limits will pave about 50,000 square meters.

In Zacatecas, beginning in September, the city of Zacatecas will begin its paving program which will consist of about 40,000 square meters for this year. In road building they expect to start an extensive program amounting to about 800 kilometers.

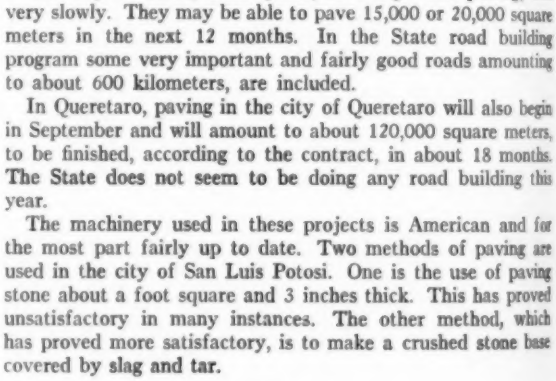
The city of Leon, Guanajuato, is doing some paving, but very slowly. They may be able to pave 15,000 or 20,000 square meters in the next 12 months. In the State road building program some very important and fairly good roads amounting to about 600 kilometers, are included.

In Queretaro, paving in the city of Queretaro will also begin in September and will amount to about 120,000 square meters, to be finished, according to the contract, in about 18 months. The State does not seem to be doing any road building this year.

The machinery used in these projects is American and for the most part fairly up to date. Two methods of paving are used in the city of San Luis Potosi. One is the use of paving stone about a foot square and 3 inches thick. This has proved unsatisfactory in many instances. The other method, which has proved more satisfactory, is to make a crushed stone base covered by slag and tar.

By Leonard G. Dawson
American Consul
Veracruz, Mexico

There has been general interest in the road building program



A Caterpillar Tractor and Austin Grader at Work on a Road Between Mexico City and Toluca

for the State of Veracruz for the past seven years, but, on account of financial conditions, very little has been done. It was not until 1930 that the work on the highway which is to connect the city of Veracruz with Mexico City, was commenced. This new road will connect with Veracruz through an extension of the Puebla-Mexico City section, and the State Government of Veracruz is building the highway from the capital of the State, Jalapa, to Veracruz, which connects with the Perote and Puebla Road. This road will be 66 miles long and constructed of concrete and asphalt. It is to be completed during 1930.

Both gravel and limestone are available in the State for highway construction, but none of these materials have been used. The old highways and many of the old stone and concrete bridges constructed by the Spaniards are still in a good state of preservation, although more than 300 years old. In places these old roads have been covered over in order to secure a smoother surface, and it is believed that by using these highways as a foundation improved motor roads could be constructed as a very reasonable cost.

The State Government of Veracruz has imported from the United States some road building machinery, and it is believed that there is already on hand more than can be used. No road equipment of any type is made locally and all machinery used is of American manufacture.

Nicaragua

By Samuel J. Fletcher
American Consul
Bluefields, Nicaragua

The demand for road construction machinery and materials in the Bluefields Consular District is very small. Practically no construction work of any kind which would create a demand for such equipment is at present in progress.

Government projects in view for the east coast of Nicaragua in case the money becomes available are limited to the construction of a highway between Stimsonville and Rama, a highway between Tasbapauni and Rio Grande, and a canal from the mouth of Escondido to Pearl Lagoon.

The very small extent to which road and construction machinery and materials are used in this district is due to the sparsity of the population and the limited purchasing power of the inhabitants, the majority of whom are unable to purchase more than the bare necessities of life. The importation of road and construction machinery into Nicaragua is so small that it is not listed separately in the annual report of the Collector-General of Customs on imports and no statistics are available to indicate the quantity imported. It is believed, however, that most, if not all, of such products imported are of American manufacture. This is due in part to the greater familiarity with American products, to the regular and frequent communication that this port has with New Orleans, and to the fact that all importers of this port and district are represented by commission merchants of New Orleans or have their home office there. The banana and mahogany companies purchase practically all of their machinery in the United States where their main offices are located.

According to the Customs Tariff of Nicaragua, gasoline and kerosene engines, concrete mixers, power pumps and other machinery used in construction are admitted free of duty.

SOUTH AMERICA

Bolivia

By Edward G. Trueblood
American Vice Consul
LaPaz, Bolivia

During 1929 two American construction companies were engaged in highway construction in Bolivia. The Foundation Co. completed 30 kilometers of highway in the Yungas section of Bolivia in April, 1930. The Cochabamba-Santa Cruz highway which was being constructed by Kennedy & Carey was abandoned early in January, 1930, because of the lack of funds. These two companies used some American machinery, although most construction in Bolivia is accomplished with Indian labor which is relatively very cheap.

There are no paved highways in Bolivia so that machinery for paving is used only in the cities. Most of the highways which are kept in repair are maintained by gangs of prison laborers who use only hand implements. Most of the dynamite used in road construction comes from a factory in Chile. North American and local cement is used in bridge and building construction, and practically all of the lumber used in Bolivia comes from the Pacific Coast of the United States.

Brazil

By Claude I. Dawson
American Consul General
Rio de Janeiro, Brazil

This consular district comprises the Federal District and the States of Rio de Janeiro, Minas Geraes, Espirito Santo and Goyaz, with a total area of 544,725 square miles, or about the same as that of Texas, California and New Mexico combined. The population is about 9,500,000. While the standard of living of the upper classes is high, the great majority of the people live on a much lower standard than in the United States, the wages being so low that they are only able to purchase such bare necessities of life as food and a minimum of clothing.

Construction and maintenance of roads is done mostly by the Federal and State Governments. For reasons of economy and to make available funds go a long way, construction in dirt and gravel predominates, durability and quality being sacrificed to the necessity of communication of any kind. Due to the same economic reasons and the plentiful supply of cheap manual labor, the use of machinery is restricted. The increasing number of automobiles has, however, contributed to a partial modification of this point of view and the present political administration has devoted special attention and effort to the task of road construction. Two roads, the Rio de Janeiro-Sao Paulo and the Rio de Janeiro-Petropolis roads, have been completed during this administration and machinery and good surfacing have been used on both roads.

The various types of road machinery used in the United States are imported and used locally, some in very limited quantities and others with more frequency. Tractors, steam and motor shovels, surfacers, graders, scrapers, compressed air machinery and tools, pumps, and a few other mechanical devices have been used on large projects, the greater proportion of the machinery being of American origin. The United States also enjoys a large share of the business done in common tools

such as picks and shovels and in galvanized iron for the manufacture of culverts.

Of the 19,785 metric tons of asphalt imported during 1929, 13,194 tons were purchased from the United States. About 3,897 metric tons of cement were also imported from the United States.

There is potentially an excellent market for American machinery and materials for use in road building and maintenance here but the actual demand is at present limited. However, with the improvement in the country's financial and economic position, there will be a correspondingly favorable increase in the demand for American products.

British Guiana

By Harold E. Riggs
American Vice Consul
Georgetown, British Guiana

No American road machinery is being used in British Guiana at the present time. This is a British colony and British goods are entered under a preferential tariff. Machinery imported from the United States pays a duty of 7 per cent, while machinery imported from Great Britain and her colonies is entered free of duty.

Chile

By Thomas S. Horn
American Consul
Antofagasta, Chile

This consular district comprises the Chilean provinces of Antofagasta and Atacama. It has not been possible to secure data regarding the road machinery in use in Atacama, but it is known that relatively little road work is being done there and it may be safely assumed that the amount of equipment is very small.

In Antofagasta, the following machinery was on hand at the beginning of 1930:

2 steam rollers, one of Chilean and one of British make
2 levellers, both of American manufacture
2 American tractors
1 5-passenger American-made automobile
4 American motor trucks

The following equipment, all of American manufacture, has been purchased under the appropriation for 1930:

3 crawler-type tractors, valued at $10,013
3 levellers with grader teeth and 9-inch scraper blades without motors, valued at $5,250
3 6-inch automatic shovels, valued at $1,125
4 1¼-yard shovels on wheels, valued at $3,650
1 grader with an extra set of teeth, valued at $1,700
1 diesel-driven roller, valued at $5,250
1 5-passenger, 1930 model touring car, valued at $2,450
1 motor truck valued at $810
Various hand tools, valued at $77.50
Total—$30,325.50

Only a part of this new equipment has arrived as yet and it is not known to what extent old machinery will be scrapped and replaced by new units. The Chilean roller is of an antiquated type and is no longer in service and the old steam roller of British make is almost certain to be taken out of service soon, in which case all of the road machinery under the control of the Engineer of the Province will be of American origin.

A Ransome 10-E Paver Working on a Rio de Janeiro Paving Contract

By Camden L. McLain
American Vice Consul
Concepcion, Chile

In 1928 and 1929 the Chilean Government passed laws authorizing the expenditure of comparatively large sums for road construction and repairs. While the importance of the central part of the country would seem to make it advisable to expend the greater part of the money thus provided for on roads in that section, it is estimated that during the next five years south-central Chile will receive no less than 40,000,000 pesos, equivalent to $4,877,000, for road repair and construction. In 1929, for example, the road connecting Talcahuano with Concepcion, a distance of 5½ miles, was paved with bituminous material and considerable progress was made on the 50-mile highway which connects Concepcion with Bulnes. Construction on two other important highways also began in 1929 and in addition relatively large amounts were expended for improvements.

The plan of the Government to provide an adequate system of highway communication in south-central Chile is creating a satisfactory market for road building machinery, and American manufacturers have not been slow to offer equipment suitable for this class of work.

Colombia

By Fletcher Warren
American Consul
Barranquilla, Colombia

The Barranquilla consular district includes a large part of Magdalena Department and the Departments Atlantico, Santander del Norte, Santander del Sur, Cumdinamarca and Boyaca. At the present time, there is a widespread interest throughout all these departments in the construction of public highways, in the building of which American machinery is playing an important rôle and will probably be used even more extensively when the present depression is passed.

The Department of Atlantico, bordering on the Atlantic Ocean and one of the smallest departments of the Republic, is very much in need of more highways, and possesses for this construction work crawler tractors, steam rollers, other road machinery and various trucks, of American manufacture. Figures are not available to show the amount of highways constructed in the other departments of the district.

The city of Barranquilla has just begun the paving of the city streets and the laying of a municipal sewerage system, to cost about $4,000,000. Most of the machinery and some construction material used is of American manufacture and the work is being done under the direct supervision of American engineers.

By Walter J. Donnelly
Commercial Attache
Bogota, Colombia

Late in 1929 and continuing into 1930, the Colombian Government suspended most of the important public works, including roads and railroads, due to lack of funds. In the period of construction many new highways were started, some of which were completed. The unfinished roads may be completed as soon as the plans for organizing the public works in Colombia are adopted. These projects are being considered by the Consejo Nacional de Vias de Communicacion, a board of engineering experts composed of Colombian, American, British and French engineers. It is expected that their ideas will be announced to the public this year.

The efficient and economical operation of American road equipment is recognized by the government departments and municipalities. Important quantities of road machinery were imported in 1927-28 and used for the construction of highways in many parts of Colombia. With the suspension of most of

the public works, the machinery was retained by the Government and will be used again when construction is resumed. American manufacturers of road equipment have been successful in this market due to the efficiency of their products, adequate facilities for servicing and practical cooperation with the buyers and contractors.

By Paul C. Daniels
American Vice Consul
Buenaventura, Colombia

Practically the only roads in this consular district are in the Department of Narino, near Ecuador, where there are about 400 miles of dirt automobile roads. At present there are no roads at all leading to or from Buenaventura, the most important port on the west coast of Colombia. Work has been started, however, on an automobile highway which will eventually connect that city with Cali, an important city in the Cauca Valley in the interior. No construction has as yet been carried on at this end, and it is not known what road building machinery is being used. The road is being constructed by an American firm, so it is probable that American machinery will be used where feasible.

It is possible that road construction is being carried on in the Department of Narino, but, due to the great distance and inaccessibility of this region from Buenaventura, it is impossible to state how much, if any, American machinery is being used. In that region, road work is usually done with picks and shovels and wheelbarrows.

By LaVerne Baldwin
American Vice Consul
Santa Marta, Colombia

The only hard-surfaced streets in the city of Santa Marta are of crushed stone and crude oil combination, which is rolled by an American steam roller. The total length of such streets does not exceed 4 kilometers, while outside of the town stretches a broad asphalt paved road for some 4 additional kilometers. No other city or town in this district has any paved streets. A highway of stone and gravel construction extends from Riohacha toward Fonseca and Fundacion.

EUROPE

British Isles

By William F. Doty
American Consul
Newcastle-on-Tyne, England

In the four northern counties of England and in one or two neighboring counties southward, some types of American road equipment and construction are utilized on at least a small scale and are giving satisfaction.

In the Midlands of England road equipment and construction machinery are produced in large quantities and meet with favor in Northern England. Unless American manufacturers establish manufacturing plants in England, it is questionable whether American products can much longer compete on favorable terms with British equipment and machinery.

The great coal strike during 6 months of 1926 caused a very grave depression in Northern England, and highway and general construction has been somewhat retarded. There has been great pressure upon the government to provide work for the unemployed on highway and other construction projects, and there has been a fairly generous response toward public road construction, and it is very likely that funds will soon become available for the development of new roads and repairs to old highways in Northern England.

In this consular district, American types of road equipment and construction machinery consists principally of portable compressors, pneumatic spaders, pneumatic drills, concrete breakers and pavement testers. On the new Tyne Bridge between Newcastle-on-Tyne and Gateshead, some American road machinery valued at about $5,000 was used, and one engineer made the statement that "The Newcastle-on-Tyne Municipal Corporation uses some American drills, pneumatic shovels and picks. American pneumatic tools cannot be beaten."

The County authorities of Westmorland use one American

The Hugh Road Building Program Initiated by the Chilean Government in 1928 *and* 1929 *Will Bring Much Needed Means of Communication to South-Central Chile. The Road Depicted Above Was Constructed by Warren Brothers of Boston at a Cost of Approximately* 2,250,000 *Pesos*

mixer and three American tractors, and a large public works contractor of Middlesbrough-on-Tees is using two 5-ton Caterpillar tractors with scrapers, and one 2-ton Caterpillar with scraper in the construction of embankments for the New Markham Bridge on the Great North Road near Newark. This company has also recently purchased a large American excavator for use on a pipe line contract for the Leicestershire Corporation near Loughboro.

By A. B. Cooke
American Consul
Plymouth, England

The County Surveyor of the Devon County Council, Barnstaple, reports that, "except for a small quantity of air compressing machinery and all jackhammer air drills, the plant in use in this division is of British origin."

The County Surveyor of the Devon County Council at Exeter states that they are using three American air compressors and one gasoline tractor.

Using these replies as a basis on which to estimate the amount and kind of American road making machinery in use in this consular district, it may be reasonable to assume that practically all of the heavy road machinery in use is of British manufacture. Inquiries in other directions indicate that there is practically no American machinery used here.

By George E. Chamberlin
American Consul General in Charge
Glasgow, Scotland

The only machinery of American manufacture used to any appreciable extent in the Glasgow District and in Scotland as well on roads and other construction projects are air compressors and pneumatic tools.

Road and construction machinery manufactured outside of the British Isles meets with intense competition from English manufacturers. Official American export figures show that only $135,000 worth of road making and construction equipment was shipped from the United States to the United Kingdom in 1928, as compared with $3,600,000 to Canada, $1,000,000 to Soviet Russia and $600,000 to Mexico. American excavator parts and concrete mixers are the most important single items imported, and while a certain proportion of this and other equipment may reach Scotland, the aggregate is small.

The United Kingdom secures over four-fifths of its asphalt and bitumen from the United States, Mexico and the British West Indies, in approximately equal quantities from each source.

By Paul C. Seddicum
American Vice Consul
Cardiff, Wales

Practically all of the road and street machinery used in this district is manufactured in Great Britain.

In the industrialized and thickly populated region of South Wales and Monmouthshire the ever-growing vehicular traffic, with its increase in volume and individual loads, is creating difficult problems for the road engineer and public works authorities. In Cardiff, for instance, there was an increase of 270 per cent in 1925, compared with pre-war days, while the traffic returns show another increase of 44 per cent from 1925 to 1928.

Many of the rural roads are only 4 inches thick with very high crowns, so that one of the problems here is how to flatten the cross-section of the road in an inexpensive manner by 4 inches, when the road itself is only that thickness.

three rural districts, each of which has its own office for the maintenance of roads and streets. Besides these there is the Senate office to maintain the Governmental roads and streets. Only the Senate office does any actual road construction or repair work, the others giving out contracts usually to private German concerns.

The Free City has approximately 600 miles of roads and streets, about two-fifths of which are macadam, two-fifths granite block and the remainder asphalt. During 1929 the State government spent about $126,700 on road work, practically all for renewals and repairs and is budgeted to spend $104,000 during 1930.

Czechoslovakia

By A. C. Frost
American Consul General
Prague, Czechoslovakia

As far as can be ascertained there is only one American tractor and road making machine in use in Czechoslovakia, practically all of the machinery of this type used in the country being made locally.

Free City of Danzig

By Robert F. Fernald
American Consul
Danzig, Free City of Danzig

Practically all of the road machinery used here is of German manufacture, with some of Swiss make.

The relatively small territory of the Free City of Danzig, about 750 square miles, is divided into the municipality and

Estonia

By Harry E. Carlson
American Consul
Tallinn, Estonia

Road building and general construction machinery used by the Government, municipalities and contractors of this country is mostly of English and German origin and partly of domestic manufacture. The only American building material which is known to be used here is an insulating and sound-proofing board, the demand for which is rather small.

France

By Edwin C. Kemp
American Consul
Havre, France

Reports from the construction bureaus of the three departments of Seine-Inferieure, Somme and Eure, state that no

I-R Portable Compressor and Pavement Breakers on Street Repair Work, London, England

American machinery is used with the sole exception of an Austin steam roller, left by the American Expeditionary Force and now used in the Department of the Eure.

The only American material reported used is bitumen surfacing purchased from various American petroleum companies, mostly with agencies located in Rouen, Seine-Inferieure.

By John Q. Wood
American Consul
Strasbourg, France

But little new road building is being done here. The road systems have been in use for many years, and the problem among road officials is the efficient upkeep at the lowest figures possible. No American machinery is used, as French and German machinery and materials apparently satisfy all requirements.

There are two large construction projects under operation in this district, namely, the Port Works of Strasbourg and the Grand Canal in Alsace with the hydro-electric plant at Kembs in the southern part of Alsace near the Swiss boundary. No American machinery or materials are used in the construction work at the port of Strasbourg, but there are two American draglines in operation on the Grand Canal of Alsace, each one reported to have cost not less than $133,000. They are in charge of American specialists and have been giving excellent results.

A clipping from "Commerce Reports" of October 7, 1929, states that two American steam shovels for minor excavation work are also in use on this project, and that the additional expense of this equipment is warranted by the extent of the work they are to perform and because of the saving in the cost of labor and supplementary equipment. With draglines of such wide operating radius, the dirt from the canal is removed and placed in a mound alongside and at some distance from the canal, where it will remain, thus avoiding the necessity of any expense for removal by manual labor, dump cars or other hauling equipment.

Germany

By W. A. Leonard
American Consul
Bremen, Germany

Leading local building and road contractors state that at present they are not using road or construction machinery of American origin. According to leading local wholesalers of such machines, there is a good demand for these products, but American machines are not very well known on the local market. Local agents say that a German manufacturer puts out concrete mixing machines similar to American makes.

Concrete machinery is not used on such an extensive scale here as in the United States, because the dwelling houses, which are mostly of small sizes, are practically all built of brick. On the other hand, concrete for large buildings, such as business houses, factories, etc., is preferred in this district.

Concrete machines of various types are also used in street building. In general the finishing of concrete roads and highways is done by large machines, which perform all the necessary work. Steel forms for concrete roads are practically unknown here. Stones are invariably used for this purpose, and it would be difficult to convince the local authorities of the merits of steel forms for roads.

By J. Klahr Huddle
American Consul
Cologne, Germany

The Cologne Consular District, densely populated and Germany's leading industrial area, is naturally an extensive and constant market for road building material and machinery. Numerous arterial and secondary highways intersect the district in all directions, while streets in towns and cities are in a comparatively good state. However, the war and the subsequent shortage of capital as a result of the depreciation of the German currency are responsible for the fact that many of the main roads have not been broadened and paved suitably so as to meet fully the exacting requirements of modern traffic. This is also the case as regards the streets in many of the smaller towns. The larger cities have so far done their best to adapt their streets and boulevards to modern traffic requirements. Since 1924, when the German mark was stabilized, considerable capital has been made available for the construction of new roads and the repair of existing ones.

With the exception of asphalt and bitumen imported from the United States, Mexico and Italy, and paving stones from Sweden, road material used in Germany is supplied from domestic sources.

Road building machines and other equipment have for many years been constructed in Germany. American shovels mounted on crawler chassis, seem to be somewhat in demand here.

By Edward A. Dow
American Consul in Charge
Frankfort-on-Main, Germany

The condition of German highways suffered very much through the effect of the World War and inflation periods. Capital as well as labor were then scarce, and activities on both city roads and country highways were confined to temporary repair in the worst places. It was only recently that the repair of German highways was undertaken on a large scale, but even the comparatively short time of four years has brought the condition of most important German highways up to a commendable standard.

American suppliers of road building machinery, as well as of road building materials, have repeatedly endeavored to enter the German market with their products, but such efforts have not as yet met with success. One of the main reasons for this failure is believed to be the fact that road building orders are

Caterpillar Tractor and Tumble Bugs Used on Embankments on the Saloniki Plain Reclamation Project, Greece

Brownhoist Crane with Vulcan Steam Hammer Used for Driving Piles on the Axios Bridge of the Saloniki Plain Reclamation Project, Greece

given by municipalities, and these are naturally, as Government offices, not inclined to give preference to foreign products a. long as domestic machinery is obtainable.

By John James Meily
American Consul
Leipzig, Germany

No American road construction machinery is used in the area comprising the Leipzig Consular District. There are several manufacturers of road construction machinery in the district, and these, together with other German manufacturers, of course, enjoy advantages over foreign firms in supplying the demand.

Greece

By Edwin A. Plitt
American Consul
Athens, Greece

With the exception of a few excavating machines imported by the Foundation Co., now engaged in swamp reclamation work in the vicinity of Saloniki, and a few machines in use near Athens on water supply and road work, there has been no great demand for road building and maintenance machinery up to the present. Funds for extensive construction work on which machinery could be profitably employed have not been available in Greece. In fact, most of the public work in recent years has consisted principally of comparatively small sections of roads near the capitol in which, however, with only a few exceptions, hand labor was chiefly employed. The spending of about $100,000,000 in public works of all kinds is being planned for the next decade.

To carry out the construction contemplated, road building machinery is to be furnished the contractor by the Government, but, if the equipment available is found to be inadequate, the contractor is permitted to acquire it in behalf of the Government. There is no doubt but that a considerable amount of excavating and general road building machinery will be required, a large proportion of which will probably be obtained from European sources. It is reasonable to believe, however, that American manufacturers may find the means to furnish some of it. No information as to the ultimate requirements in this respect is as yet available, but it is estimated that several million dollars may be expended on machinery and supplies to be imported from abroad.

On the other hand, manual labor is resorted to for all operations in which it can be employed. In fact, the present program of public improvement was, in a measure, inspired by the need of absorbing Greece's unemployed.

By Charles J. Pisar
American Consul
Saloniki, Greece

Extensive public works are now in process of execution or contemplated in the Provinces of Greek Macedonia and Thrace, which comprise the Saloniki Consular District. These works include the reclamation of the Plain of Saloniki, reclamation works in Eastern Macedonia, port works at Saloniki and Kavalla, construction of streets and sewers in Saloniki and the building of national highways.

On the reclamation works in the Plain of Saloniki, a number of draglines, mounted on pontoons and crawlers, are in use as well as steam hammers for driving piles. Caterpillar tractors and dump trucks are employed. Similar machines are also being brought from the United States for use on the Struma contract in Eastern Macedonia.

In Saloniki one domestic construction company, which has the contract for the sewerage system, owns and operates a small German excavator. Excavators, graders and scrapers, however, are not employed in road construction. Labor is exceedingly cheap and abundant, and there is no need for labor and time-saving devices. Laborers employed on highway construction are paid from 55 to 60 drachmas, or 70 to 77 cents, per day.

Hungary

By John H. Morgan
American Vice Consul
Budapest, Hungary

Following the war there was very little road construction activity in Hungary up to 1927, other than routine road maintenance and repair work, provided for in the ordinary State and County budgets and carried out by means of old-style prewar machinery. The necessity for more extensive road construction became increasingly evident, however, and an extensive national road building program was drawn up in 1927.

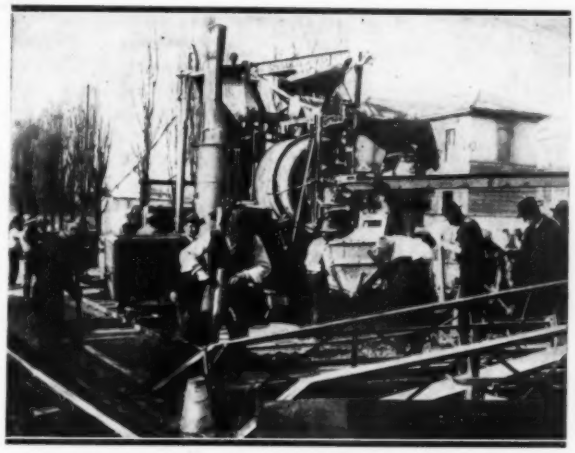
Although it was well known that it is the fixed policy of the Hungarian Government to require the use of Hungarian products in all enterprises in any way subject to Government supervision, the Royal Hungarian Ministry of Commerce, in

An American Made Dragline in Service Near Budapest, Hungary

charge of road building, was supplied by this office with as complete information regarding American road building methods, machinery and materials as could be obtained in an endeavor to establish in the minds of the local authorities the superiority of American methods and machines. The Government officials appeared favorably impressed, and, although the use of Hungarian-made machinery is insisted upon wherever practicable, some of the original American inquirers have been able to enter this market on a moderate scale.

The original 1927 program has been much reduced because of the difficulty of obtaining sufficient funds and only a comparatively small amount of construction has actually been carried out. During 1929 a public tender for the construction of 1,000 kilometers of roads was announced, but by a later decision only 195 kilometers at a total cost of $2,975,000 was allotted to 19 contractors. Bids for the remaining construction of 805 kilometers were rejected because of what were regarded as unreasonably high prices. The contracts awarded called chiefly for repair and reinforcement of existing roads, with small stones, gravel, concrete, topeka, asphalt-concrete, bitulithic and bituminous brick.

All road building contractors, however, who participated were required to bind themselves to use only Hungarian machinery and material except in cases where the contractor had foreign machinery and materials already in his possession or in cases where the necessary machinery or materials cannot be produced by the Hungarian industry. As the same policy will be followed in all future bids, the introduction of American road building and construction machinery is confronted by almost unsurmountable difficulties.



American Concrete Machinery in Use in Milan, Italy

The Palatinus Roadbuilding Co., was induced to purchase two American concrete road finishers, which demonstrated their excellent performance on the roads from Budapest to Vienna and Budapest to Siófok, and will also be used in the construction of 60 kilometers of concrete roads from Budapest to Cegled. The excellent quality of the work of the two finishers is reported to have been highly commended by the Ministry of Commerce.

The Samasköi Bazaltbánya R. T., associated with Warren Brothers, of Boston, is engaged in the construction of 13 kilometers of road. One American asphalt mixer and 2 rollers were shipped to this firm by Warren Brothers.

The Müszaki és Epitési R. T., introduced American corrugated iron culverts, power shovels and miscellaneous machinery.

The Magyar Altalános Utépitö R. T., which is closely affiliated with the leading Hungarian cement manufacturer, purchased American concrete curb and road forms, one road finisher and one paver. The performance of these American products has proved to be excellent.

Italy

By James W. Gantenbein
American Vice Consul
Milan, Italy

With the exception of the construction of the automobile toll roads called "autostrade" which have recently been built and more of which are in course of construction, the road building activity in the Department of Lombardy is confined almost entirely to road maintenance and improvement. Although hand labor is extensively employed for this work, owing to the low wages, a very few expensive paving machines, particularly of American origin, have been used during the last few years.

Although there are a number of American excavators in use in Italy, these are mainly used for work other than road construction. There are reported to be about six American pavers in operation in Italy, these being of a well-known make. Two of these machines have been employed in the paving of the autostrade highways. American hot mixers made their appearance in Milan a few years ago. These have given very satisfactory results and a number of streets in Milan were paved with them.

By William W. Heard
American Consul
Turin, Italy

The Consulate has been informed from a number of sources that at present there is no American road machinery being used in this district.

Work is now under way on a special automobile road to connect Turin with Milan. The engineer in charge of this work, on which only a part of the grading is being done at present, states that as yet there is no American machinery being used. Perhaps later on when the pavement is laid, which will not take place for at least another year, some types of American road machinery will be used. The construction of this road will be quite an undertaking, involving a total distance of 126 kilometers and necessitating the building of 5 bridges. The road will be 8 meters wide and so designed, either by embankments or fences, to prevent anyone from traversing it who has not been admitted at a prescribed place and paid the necessary toll. In common with other toll roads now operated out of Milan, the one now being built here will be privately owned and there will be no speed limit. The cost of construction of this road is estimated at $7,890,000.

Luxemburg

By Frederick L. Washbourne
American Vice Consul
Luxemburg, Luxemburg

Stone occurs everywhere in the Grand Duchy of Luxemburg, and in the case of road building it is secured on the spot or with a very short haul. The principal machinery used is a heavy roller, sprinkler and kettle for heating tar.

There is only one short stretch of concrete road in the Grand Duchy. Roads are constructed from stone broken by hand and rolled, then topped with sand and gravel and surfaced with tar. No American machinery is in use at the present time, and the heavy rollers in use are mostly of German manufacture.

Maltese Islands

By Hugh S. Miller
American Consul
Valetta, Malta

No American road machinery is employed in Malta, nor, so far as it has been possible to ascertain, is any American construction machinery and material used in building, hand labor and local materials being almost universally employed.

The Maltese Islands are somewhat unusual, in that they are composed, practically in their entirety, of different kinds of limestone, furnishing an inexhaustible supply of construction

material. Over the stone is a thin layer of soil, averaging about 18 inches in depth. The drawback to the use of local stone in road construction is that it is soft, easily worn into irregularities and very dusty. The local Government has given serious consideration to the question, and considerable improvement in roads, streets and pavements has been made in the past few years.

Netherlands

By Charles L. Hoover
American Consul General
Amsterdam, Netherlands

The construction of roads in the Netherlands is carried on by all the political units into which the country is divided, the national government, the provinces, the townships, local drainage boards, "polder" boards, and, in a few places, by the Department of National Defense and by private individuals. The national government of the country, the provinces, and some of the municipalities or townships, have carefully formulated programs of road construction.

The total length of the existing roads which are considered as "surfaced" roads is 15,816 miles of which 11,991 miles are under the management of the townships and other local units, the national system being 1,123 miles and the provincial roads 2,704 miles.

With the exception of a belt of sand dunes which follows the North Sea along most of the coast of the country, the western third of the country lies below the level of the sea and the soil is composed of alluvial deposits of unknown depth. Consequently the problem of constructing roads which will sustain heavy traffic is a serious one. The country itself possesses practically no material from which roads may be built as there are no stone quarries or gravel beds except in the narrow strip lying between Belgium and Germany and it is necessary to import from Germany practically all of the material used for the construction of the foundation and for the surfacing of the roads where brick manufactured in the Netherlands is not used.

Inasmuch as most of the building or roads which require the use of machinery is done by contractors, it is not possible to determine the extent to which machinery is used, but on the whole it may be said that hand labor is used to a much greater extent than in the United States. The Province of Groningen which reports that it now has 378 kilometers of roads, including the recently completed sections of new highway, reports that it has three motor and steam rollers and a number of ordinary concrete mixing machines and asphalt kettles. The municipality of Groningen, the capitol of the Province, has the following equipment:

2 French motor trucks
1 American pneumatic tamping and boring machine
1 Amer can tractor
1 American asphalt spraying machine with hand pump
1 American asphalt spraying machine with motor pump
1 Swiss stone crusher
1 Dutch motor membrane pump
1 Dutch centrifugal pump

The Province of Utrecht has one 12-ton American asphalt mixing machine, the remainder of its mixers, road rollers and concrete laying machines being of English, Swiss, Dutch and German manufacture.

A study of the various kinds of road making machinery in use in the Netherlands shows that it is difficult for the United States to compete in the market for heavy, bulky machinery as the ocean freight charges are disproportionately high in comparison with the value of the shipment. England and Germany, being close at hand can furnish these pieces of equipment at prices which afford no profit to American manufacturers. The demand for American road building machinery is restricted to equipment for handling asphalt, tractors and to special tools, such as pneumatic tamping and boring machines.

Norway

By Thomas H. Bevan
American Consul General
Oslo, Norway

According to a report furnished by the Director of Highways, the following American road machinery is in use in Norway: approximately 100 Fordson tractors and practically all of the trucks, the estimated number of which is about 100. The air compressors are chiefly of American manufacture, 4 of these having been purchased in 1930. About 20 American road graders are now in use and cutting edges for motor road scrapers and horse-drawn scrapers are as a rule imported from America. In addition, some other machinery of American origin, such as transporters, drag scrapers and the like, are in use.

The demand for road building equipment is naturally limited by the appropriations made by the Norwegian Government for construction purposes.

By George Orr
American Consul
Stavanger, Norway

The use of American made road and construction machinery and materials is by no means the rule in Rogaland Province, notwithstanding the excellent reputation that standard American makes enjoy. The reason is chiefly in the matter of cost. Domestic and European products are purchased frequently because they are cheaper and delivery can be obtained more readily. There is also an evident tendency on the part of local importers to substitute articles of German manufacture for American goods wherever possible. Only in the case of motor vehicles and tractors are conditions decidedly in favor of American products and, in common with the rest of Norway, somewhere between 90 and 95 per cent of such commodities are imported from the United States.

Of the road building machinery and equipment listed in a recent report as in use in the province of Rogaland, one motor road scraper, two tractors and three motor trucks are of American make, while of the equipment belonging to the city of Stavanger, the American machinery includes one tar mixing plant and two motor trucks.

Since the purchases of road building machinery and equipment are made largely through the National Bureau of Roads at Oslo, it would appear that American manufacturers might effectively obtain increased imports of their products into Norway through active agents at the capital who would keep in touch with the requirements of the National Road Bureau. City engineers of the various municipalities are doubtless greatly influenced in their choice of road building machinery and equipment by action taken by the national government officials.

Poland

By F. Cole
American Consul General
Warsaw, Poland

According to available official statistics, the overall length of Polish roads at the beginning of 1929 was 224,715 kilometers, of which 174,979 kilometers were natural sand and clay and the remainder were constructed roads.

Road building and repair in Poland are still greatly hampered by lack of funds, although the need for more and better highways is fully realized by the Polish authorities, and considering the limited funds available a great deal has been accomplished during the past few years.

Although the number of motor vehicles is steadily increasing, there are still a large number of horse-drawn vehicles in this country, and the mixed traffic is also a serious factor in Poland's road problems. Considerable experimental work is being done on short stretches of roads. Some of the experiments have been successful, but so far a uniform type of road has not been decided upon. Poland possesses considerable natural resources, including gravel, sand, rock, cement and tar and asphalt by-products of the domestic coal and petroleum industries.

Road machinery, mostly pneumatic picks and pneumatic ripping equipment made by two well-known American manufacturers, is being used quite extensively by street maintenance departments in the city of Warsaw and other large Polish

cities. With the exception of an occasional concrete mixer, few other types of construction machines of American origin are being used in Poland at the present time. This is due no doubt to the difficult money conditions prevailing here at this time, which discourages the granting of credits by American manufacturers such as are said to be extended by European manufacturers.

In street construction, the city of Warsaw seems to be far in the lead of other Polish cities. Tar block pavements have been tried in some sections and recently a number of streets have been asphalted.

Portugal

By Samuel T. Lee
American Consul General
Lisbon, Portugal

The majority of the roads in southern Portugal are made of macadam, while the more important highways are of macadam covered with an asphalt surface, there being no concrete roads in this district.

Recently the Portuguese Government has made appropriations for the construction and repair of roads which a few years ago were in very bad condition. The current budget includes about $2,430,000 for the repair of existing roads and $1,215,000 for the construction of new roads. In 1928 about 1,242 miles of roads were reconstructed and about 62 miles of new roads were built in all of Portugal. Labor here is very cheap, and much of the work is performed by hand, with the result that there is but little demand for modern road making machinery.

Very little road and construction machinery of American manufacture is used in this district and inquiries indicate that only five American-made machines, two road graders, two tractors and one dredge, are at present in use.

Switzerland

By Frederick W. Baldwin
American Consul
Lausanne, Switzerland

This consular district consists of the city of Lausanne only, where American road and construction machinery are seldom used, preference being given to Swiss, German and English manufacturers, owing to lower prices and greater facility in delivery. A handicap to increasing American business in this locality is the fact that American credit terms do not compare favorably with those granted by other importers.

Yugoslavia

By Stewart E. McMillin
American Consul
Belgrade, Yugoslavia

American road building and construction machinery is used to a very small extent in this consular district. The only examples worth mentioning are the English Ingersoll-Rand drills and one Cletrac and one Caterpillar tractor which have been recently introduced and are now engaged on reclamation work at Pancevo, near Belgrade.

ASIA

Ceylon

By Stillman W. Eells
American Consul
Colombo, Ceylon

As far as could be ascertained no American road machinery and very little American construction machinery is used in Ceylon. In fact very little machinery of any kind is in use here, due to the plentiful supply of cheap native labor.

The public roads in Ceylon are built and maintained by the Government. Likewise most of the important construction projects have been undertaken by the various Government Departments, whose supplies are purchased on indent through the Crown agents in London. British material is supplied in almost every case.

There is, however, a large amount of American asphalt used for road construction and maintenance. In 1929 the imports of this material from America comprised over one-third of the total imports from all countries.

China

By David C. Berger
American Consul
Swatow, China

There is no road machinery whatever used in this district, either of American manufacture or of any other kind.

By C. E. Gauss
American Consul General
Tientsin, China

There are, according to statistics compiled at the Consulate General, some 12,150 miles of so-called motor roads in the entire district, but except for a few miles in and about Tientsin and Peiping, these are dirt-drowned and ditched and quickly rendered impassable by the native narrow, heavy steel-tired carts which destroy their level surface. The rainy season which lasts from mid-June until the latter part of September, and sometimes later, completely washes out great sections of these roads each year and, of course, makes them impassable to other than native, animal-drawn vehicles. The Peiping-Tientsin motor road, cited as one of the best in the district, is usually completely inundated in large sections after heavy rainfalls.

There is little or no American road machinery in use in this consular district. This is due both to its expense and to general conditions which at present prevent any extensive amount of road construction.

The China International Famine Relief Commission has been strongly advocating the employment of famine relief funds in the building of urgently needed roads in China. The Engineer-in-Chief of this Commission has made certain proposals which contemplate the donation or loan by American manufacturers of road building equipment for use in demonstrating the advantages and superiority of such machinery over hand methods. If successful the plan will undoubtedly assist in developing a market for this machinery.

Present road building activities are apparently centered in Kweichow, Kwangsi and other southern provinces which do not form a part of this consular district.

Chosen

By C. H. Stephan
American Vice Consul
Seoul, Chosen (Korea)

At the time of the annexation of Chosen by Japan in 1910, there were practically no modern highways in this country. Since that time a comprehensive highway system has been developed through the cooperation of national and local engineering officials. At the end of 1928, according to the latest available Government statistics, 10,767 miles of first, second and third class highways had been completed, as part of a projected mileage of 14,929 miles. The roads are classified according to their width as: first class, 24 feet or more; second class, 18 feet; and third class, 12 feet. Practically all the above mileage is for earth or gravel roads.

In the larger cities asphalt, tar or other hard-surfaced roads have been or are being constructed with the use of modern equipment such as steam rollers, tar furnaces, tar sprayers, etc., while in the suburban or rural districts, road construction is practically entirely by coolie labor using hand tools, stone rollers drawn by hand or by bullocks, and other crude equipment and primitive methods.

So far as could be ascertained the only substantial road building machinery now in use in Chosen consists of three American steam shovels and ten road rollers of British manufacture, other lighter equipment, such as steel dump cars, light and narrow gage rails, etc., having been imported from Japan.

Hong Kong

By Harold Shantz
American Consul
Hong Kong

There are 250 miles of roads in the Colony of Hong Kong, some of which are closed to motor traffic because of their steep grades. However, all of the motor roads are in excellent condition for such traffic. The estimated expenditures for the construction and maintenance of roads and bridges in the Colony of Hong Kong during 1930 amount to $1,600,000 Hong Kong currency or about $500,000 United States currency. The roads in this district compare very favorably with the roads in a progressive district in the United States, consisting mainly of ordinary macadam, tar macadam, asphalt, sand carpeting laid on macadam and 2-inch asphalt laid on a cement concrete base.

Most of the roads are constructed by the Public Works Department and all of the asphalt surfacing is done by this Department. Roadway construction contracts are frequently let to local contractors on the basis of a schedule of prices published by the Government over which the contractors bid a percentage of increase.

Practically all of the asphalt used in this district comes from the United States. Road grading machinery is not used in this colony because of the mountainous and rocky nature of the land and also because coolie labor is considered cheaper, contractors finding it cheaper to employ coolie labor than to use the steam shovels which they already own. Some air compressors are used for rock drilling, but hand drilling is generally considered cheaper even though slower.

All machinery used by the local government in road building and maintenance is ordered by the Director of Public Works in Hong Kong usually through the Crown Agent for the Colonies in London, but occasionally through local importers.

Persia

By Henry S. Villard
American Vice Consul
Teheran, Persia

As far as is known, no American road machinery has ever been used in Persia. For the past year and a half, Ulen & Co., has been engaged in building a trial section of railroad in the South of Persia and, although most of the supplies for this were purchased in Europe, a certain amount of American-made construction equipment, was imported. This equipment includes:

2	portable 220-foot-per-minute gas engine driven air compressors
1	stationary 350-foot-per-minute belt driven air compressor
12	air riveting hammers
1	air chipping and calking hammer
6	air-operated wood boring machines
23	hand-operated boring machines
1	Triana tie-boring machine
2	25-ton locomotive cranes
2	¾-yard dragline buckets
18	track drills
10	air-operated rock drills
18	hand cars
26	push cars
5	motor-driven inspection cars
24	concrete carts
1	30-kw., 250-volt, D.C. generating set with diesel engine drive
2	7½-kw., 250-volt, D.C. generating set, with gas engine drive
1	10-kw., 250-volt, D.C. generating set, with gas engine drive
1	jinniwink derrick with 35-foot boom and hand crab
2	structural steel lattice-type gin poles, 70 feet long
1	steel stiffleg derrick, with 60-foot boom and rated capacity of 8 tons
1	pile-driving rig complete to handle 2,000-pound drop hammer
1	skid-type pile-driving rig with ways 69 feet long
1	set 70-foot structural steel hanging leads
1	set 50-foot structural steel hanging leads
3	steam-operated pile driving hammers
1	2,000-pound drop hammer
1	7 x 10-inch double-drum steam hoist
1	7 x 10-inch double-drum steam hoist with separate slewing engine
1	9 x 10-inch double-drum steam hoist
2	single-drum 12-horsepower gas engine driven hoists
2	single-drum 25-horsepower gas engine driven hoists
6,000	feet of ½-inch, 6 x 19 plow steel wire rope
10,000	feet of ⅝-inch, 6 x 19 plow steel wire rope
5,000	feet of ¾-inch, 6 x 19 plow steel wire rope
3,000	feet of ⅞-inch, 6 x 19 plow steel wire rope
10,000	feet of 3/16-inch guy wire
2,000	lineal mt. portable track, 36-inch gage, 30-pound, A.S.C.E. section in 15-foot sections with heavy duty steel ties
50	1-cubic yard cradle dump cars of 36-inch gage
24	36-inch gage steel platform cars
2	7-S gas engine driven concrete mixers
1	14-S gas engine driven concrete mixer
48	10-ton double-acting jacks
6	20-ton automatic geared lowering jacks
4	50-ton self-lowering governor controlled jacks
2	gas engine driven centrifugal pumps, delivering 100 gallons per minute against a 25-foot head
6	gas engine driven triplex pumps, delivering 50 gallons per minute against a 350-foot head
1	gas engine driven double-acting pump, delivering 55 gallons per minute against a 288-foot head
3	gas engine driven diaphragm pumps
1	12 x 8½-inch duplex, piston pattern steam pump
4	portable saw rigs
1	set of sand rolls with a capacity of 10 tons per hour
6	800-candlepower carbide lights
4	20-ton gas locomotives
6	10-ton trailers
3	10-ton tractors
41	5-passenger touring cars
6	4-ton trucks
50	1½-ton trucks

AFRICA

Mozambique

By W. Quincy Stanton
American Vice Consul
Lourenco Marques, Portugese East Africa

In Portuguese East Africa (the Colony of Mozambique) there are about 6,500 miles of motor roads, that is dirt roads which have been improved to some extent, usually by grading, graveling and wetting and also by the construction of bridges and concrete fords. In addition, there are perhaps 2,500 miles of unimproved roads. There are, of course, many miles of trails which cannot be considered in the road statistics. It should be remembered that these roads serve an area of approximately 300,000 square miles or about the size of the State of Texas and Maine combined, and in a part of the world where there are few railways. Certain of the roads, particularly the main highways from Lourenco Marques to the South African frontiers and from the town of Mozambique to the inland estates adjacent to it, are considered among the best in southern Africa. Nevertheless, the network of roads throughout the colony has not been completed sufficiently to permit of motor travel between the northern, central and southern districts. Almost all the roads extend east and west.

The colony is divided into two major sections politically, the so-called Province of Mozambique or the State-administered area, and the Territory of the Chartered Company of

Mozambique. The roads in each are constructed by the appropriate Departments of Public Works, but there are also road-building units organized in connection with the large agricultural estate corporations, especially for the concession companies.

These roads are built almost entirely by Kafir or native negro laborers, most of whom are in a quasi-jungle stage, living in their native kraals or huts. Their tools and implements are usually very crude and it is quite common to see them building or repairing a road, equipped only with old hoes, straw baskets and gasoline cans for carrying water and gravel.

There have been some units of regular road building machinery imported by the government organizations into the Colony, particularly rollers, scrapers and wagons. Some of this equipment is power-driven by steam or gasoline engines, although a large share of it is drawn by oxen or by the native workers themselves. A very substantial share of this machinery is of American origin.

Morocco

By Parker W. Buhrman
American Consul
Casablanca, Morocco

There is no American road making machinery in use in this district at the present time. Up to a short time ago, native labor was cheap and plentiful. The use of machinery in road building was discouraged with a view to giving employment to the local tribesmen, and contracts for road building were let out in such small sections that contractors were not justified in employing expensive machinery.

Conditions are now changing. Labor is not so plentiful and its economic condition is somewhat improved, so that the disposition now is to encourage the use of more machinery. The Public Works Department of the Protectorate Government has purchased American road making machinery for experimental purposes and it is understood that this machinery will shortly be put into operation.

By John J. Coyle
American Vice Consul
Dakar, Senegal

During the past two years two dragline excavators have been purchased by the government here from an American firm for work in the Niger Valley. All road construction is carried on by the French West African Government, native labor is abundant and cheap and machinery is not used to the extent that it is in other countries. Moreover, practically all of the colonies are of a flat and more or less desert country and very little road making equipment is required.

The principal difficulty in building roads here is the lack of suitable foundation materials and the only machine required is a steam roller. All construction machinery is supplied through the Department of Public Works of the Colonial Government and is brought from France.

PACIFIC ISLANDS

Fiji Islands

By Quincy F. Roberts
American Consul
Suva, Fiji Islands

With the exception of the municipalities of Suva and Levuka road building in Fiji is carried out under the supervision of the Commissioner of Works at Suva, an official of the Colonial Government. The Colony is divided into 18 districts and road making in each of these districts is carried out by district engineers or local road boards, consisting of Government officials and other residents of the district.

The Colony of Fiji has a road system consisting of approximately 365 miles of road suitable for motor traffic at all times, another 100 miles of road suitable for wheel traffic in good weather and approximately 1,300 miles of bridle paths. Motorable roads in Fiji are scattered throughout the 18 districts on a number of islands and do not form a continuous road system. The longest road in Fiji extends from Penang on the west coast of Vitilevu to Nadi on the north coast of the same island, a distance of about 100 miles. The longest continuous stretch about Suva is the road to Bau, some 20 miles from the capitol.

Road building equipment used here consists principally of road rollers, scrapers, equipment for heating tar, trucks and tractors. Outside of small tractors used for grading purposes and perhaps a few scrapers, no American road building machinery is used in the Colony of Fiji. The municipality of Suva imports bitumen from California for surfacing the streets of that city, a mixture of coal tar and bitumen being used as a binder.

Society Islands

By William P. Garrety
American Consul
Tahiti, Society Islands

The highways of Tahiti are constructed and maintained by the Department of Public Works. At present there are one tractor, three dumping carts and one concrete mixer. All road machinery and construction machinery in this consular district are supplied by the French Government.

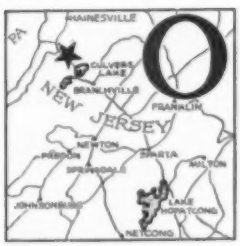
The only highway of any importance is on the Island of Tahiti. There are 200 kilometers, or about 124 miles, of highway and it runs completely around the island, being approximately 15 feet wide and having a foundation of crushed stone.

There are no duties assessed on road machinery nor on construction machinery and no detailed system of road cost accounts is kept in the Department of Public Works. The methods used by the Public Works Department are in general the same as are used in the United States, except that there are no trained highway engineers to assist the Chief of the Department.

The laborers available for road construction are Tahitian and Chinese. They are paid about 20 francs or 80 cents, a day. There are also coolies from Indo-China engaged to work by the month on the highway throughout the year, who receive 200 francs or about $8 per month, in addition to their board and free medical care.

Haul Batches Thirty Miles *or* Develop Local Aggregate?

New Jersey Contractor Settled the Question Quickly on Job Involving Heavy Grading



ON some concrete paving jobs the big problem is where to secure a sufficient amount of water for mixing, sprinkling and curing. On others the major question to be settled is the choice of railroad for delivery of cement and aggregate, but on the Salmon Bros. job on Route S-31, Section 1, in Northwestern New Jersey, the problem was where to secure the sand and stone as the nearest commercial plant was located in Netcong, some 30 miles away. Intensive prospecting showed an excellent gravel deposit at about the center of the job which was developed with a complete sand and gravel plant with washing equipment and batchers.

180 Working Days Allowed to Build Over 7 Miles of Concrete Road Including Grading

The contract for the grading and construction of 7.268 miles of the 20-40-foot Federal Aid Project was let October 15, 1929, and grading started the following day. The contract called for 180 working days, but New Jersey State Highway Specifications allow "free time" between December 1 and May 1 because of weather conditions.

The project was about 90 per cent relocated from the existing bituminous macadam highway, but 50 per cent of the relocation was over an old stage toll route which had a 66-foot right of way which was widened to 80 feet. Traffic was maintained over the old road by the contractor, but no specific item covering this appeared in the contract.

Quantities

Earth excavation amounted to 169,577 cubic yards, rock excavation, 41,814 cubic yards and a borrow, 86,956 cubic yards. All boulders over ½-yard in volume were paid for as rock. In the middle section, the haul from borrow reached the maximum of 2 miles, but this was only on a very short section.

Richards & Gaston, Somerville, N. J., were subcontractors on excavation for 1.67 miles on the middle of the job, operating a Marion 1-yard gas-electric shovel.

The general contractors for this project were Salmon Bros., Netcong, N. J., who operated two Bucyrus-Erie steam shovels and one Bucyrus-Erie gasoline shovel. In addition, three Caterpillar Sixties with La Plant-Choate bulldozers handled all of the material on the fills.

Drainage Structures

The entire construction crew of Salmon Bros. included 40 laborers and operators in which figure was included the bridge gangs. On the job there were seven bridges and one box culvert. The two bridge subcontractors were Joe Rogers of Succasunna, N. J., who built three bridges and L. H. Card of Hackensack, N. J., who built one 86-foot span bridge with center pier. The other bridges were small affairs, one being a barrel arch of about 10-foot span at the spring line and 147 feet across the road.

About 1,770 feet of 8 to 24-inch double strength vitrified clay pipe and 518 feet of 36-inch reinforced concrete pipe and 2,371 feet of 18 to 36-inch cast iron pipe where only small cover was available, were used as drainage culverts.

COMPLETE SAND AND GRAVEL WASHING PLANT SET UP

With 88,560 square yards of 9-inch concrete pavement to pour, the contractor thought seriously of the question of aggregate. With the nearest commercial plant at Netcong, 30 miles away, he decided to set up his own gravel plant on the job.

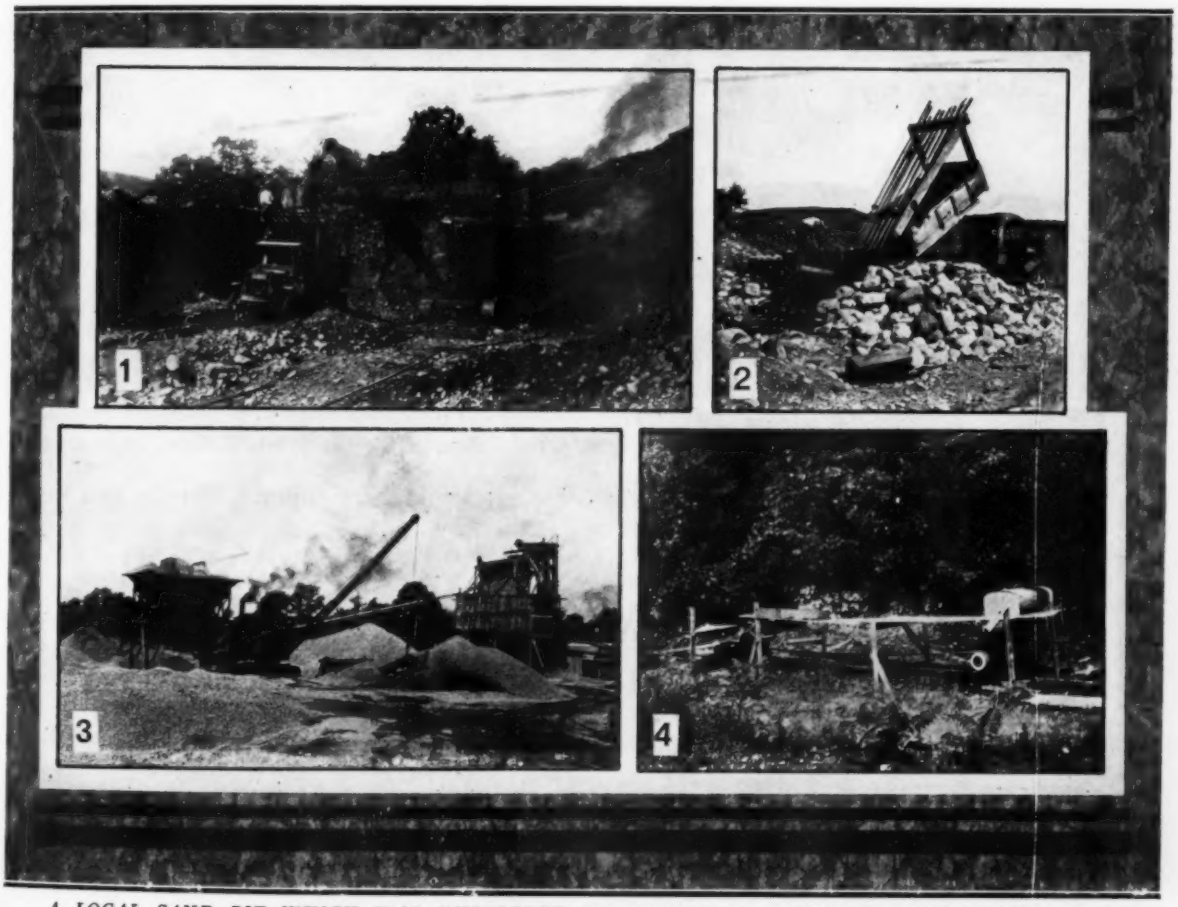
A Bucyrus-Erie steam shovel located in the pit shoveled to one or two trucks which shuttled to a rail grizzly and hopper which fed a 50-foot Robins belt conveyor delivering to a sloping rail grizzly with the spacing about 1½ inches clear. The fines fell through to a bucket conveyor which raised them to a Champion washing plant equipped with cylindrical screens. The large material not passing through the rail grizzly dropped to the crusher, the discharge from which was also delivered to the bucket elevator. Oversize from the screens was returned to the crusher. The bucket elevator was run by a LeRoi gasoline engine and the crusher, washer and belt conveyor by a Fairbanks-Morse distillate engine.

Water for the washing plant was supplied almost as though by a miracle. With a stream at a considerable distance, the contractor decided that by digging a pit some ground water might be encountered and then the pit could be filled with water which would circulate through the plant and be used over and over. When the pit was dug, sufficient water continued to flow in to take care of all of the needs of the plant, so a 200-gallon per minute LeCourtenay centrifugal pump operating at 1,450 revolutions per minute was installed to supply the wash water through a 6-inch pipe. The belt connecting the LeRoi engine driving the pump was covered with a corrugated iron roof because the heavy dews in this section of the country produce such excessive slippage that the power plant could not deliver sufficient power to the pump.

NOVEL STOCKPILES AND BATCHING PLANT

A three-compartment Erie steel AggreMeter was mounted on concrete foundations with a corduroy drive of 6 x 10 planks beneath and guides to center the trucks under the batchers and minimize spillage.

From the center of the batcher a ring of 40-foot radius was described and a barricade erected. This left sufficient space for the Erie steam crane to operate and the barricade acted as the starting point of radical partitions 45 degrees apart, except for an open space of 90 degrees which made up the driveway at the front of the batcher. Into the two front compartments, trucks from the sand and gravel washing plant dumped ¾-inch stone, into the next two compartments 1½-inch stone and in the two compartments at the back,



A LOCAL SAND PIT WHICH WAS DEVELOPED BY SALMON BROS., NEAR CULVERS LAKE, N. J.
1. An Erie steam shovel loading the shuttle truck on which a rail grizzly was mounted. 2. The shuttle truck dumping into the crusher hopper. 3. The sand washing and batching plant. 4. The LeCourtenay centrifugal pump driven by a LeRoi engine through a belt. Note the corrugated iron roof to protect the belt from heavy dew

the sand was dumped. This made up a particularly effective stockpile one-half of which could be used one day by the crane, while the stock in the other half was being replenished by trucking without interference between the crane and the stock trucks.

TRUCK FLEET STOOD HEAVY PUNISHMENT

Mack trucks were used exclusively for hauling both from excavation and for batching. They were equipped with Mack hoists and steel bodies with double bottoms. Durng the winter, when excavation was proceeding rapidly, a flexible tube was run from the exhaust under the body so that the double bottom was heated and excavated material could not freeze to the truck body.

On one of the trucks heavy stone broke the frame four times and in each case it was welded at a local shop which was found to be cheaper than the use of a portable unit on the job. It was found that two of the breaks were caused by the weakening of the channel by the heating of previous welds. In order to obviate this, the channel was finally welded along its length instead of across it and no more trouble was experienced.

HANDLING GRAVEL FILL ON THE SALMON BROS. JOB

1. *Heavy duty Mack truck dumping gravel on the fill.* 2. *A Caterpillar Sixty with bulldozer spreading the fill*

PERSONNEL

J. B. Salmon was in charge of the operations of the general contractor, Salmon Bros. of Netcong, N. J. For the New Jersey State Highway Department, M. L. Cooper was Resident Engineer, assisted by Emile Benoist, Assistant Civil Engineer, and C. A. Burn, Division Engineer.

Why Some Bits Fail to Stand Up

WHEN a well drill bit checks or cracks up the center when put in the quenching tub, after being heated and dressed, 99 times out of 100 it can be traced to any one of the following causes:

1—Quenched at too high a temperature. The bit should be heated for hardening just above the critical point or magnetic stage, which is 1,450 degrees Fahrenheit. This can be determined by using a small magnet. When the magnet fails to attract, the bit should be put in the water.

2—Steel not properly normalized. When a drill bit has been sharpened and is ready for hardening, it should be allowed to cool until the steels turns a black color before reheating for hardening. If allowed to cool the steel will normalize and all forging strains will be relieved.

3—Immersed too deep in the water. The bit should be quenched only as deep as the hardness is required, which should be from 1½ to 2 inches for 6-inch bits.

4—Bits not properly heated. A bit should be heated uniformly, turning it frequently in the fire to prevent heating one side faster than the other. If allowed to get red hot on one side and the other side remains cold and black, the expansion will cause strains to rupture the grain structure of the steel and cracks will be sure to develop.

5—Removed from quenching tub before sufficiently cooled or water thrown on the bit to hasten the cooling.

6—Forging or working the steel after the temperature drops below the magnetic stage. Bits should always be heated to a temperature of about 1,800 degrees Fahrenheit before working the steel, otherwise the grain structure will be damaged.

It is impossible to detect the proper forging and hardening temperature of bits without the use of a magnet. In bright light or sun the steel will look black even when at a temperature which would show quite a bright red color in a dark place or on a cloudy day. A little practice in the use of the magnet will enable anyone to quickly determine the temperature of the steel, regardless of the light conditions.

—Reprinted from the Armstrong Driller.

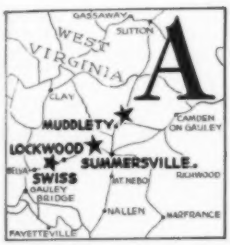
Weld Design and Production

A NEW book on welding, "Weld Design and Production—With Particular Application to Safety and Cost," by Robert E. Kinkead, deals with the topics how to design safe and secure welds, how to control the manufacturing process to insure the production of the welds which have been designed and how to predict and control the cost. The book is primarily concerned with these problems as they arise in welding as a repetitive manufacturing process, but a part of the book, the information on design, which shows what happens inside the weld under practical severe conditions, is also directly applicable to individual repair jobs.

Some of the subjects it covers are prediction in manufacturing, why welds are made, how welds are made, the effect of physical conditions on weld behaviour, welding procedure control and machine welding. The book is compact and concise, and is written for the use of the experienced manufacturer and engineer, and also for the practical operator who wants a better understanding of his job.

"Weld Design and Production" is published by the Ronald Press Co., 15 East 26th St., New York. Price: $4.00.

Contractor Opened Two Quarries for 31.5-Mile Macadam Road Job



A GROUP of six traffic bound macadam surfacing projects totaling 31.5 miles between Swiss, Lockwood, Summersville, Muddlety and about 4 miles beyond were awarded to the Codell Construction Co., of Winchester, Ky., and work started on May 10, 1930. The entire group of jobs will be finished by November 1, 1930.

The grading was completed several years ago, and since its completion the State has put on a local gravel surface to preserve the grade. The new surface of traffic bound macadam was laid 18 feet wide with about 2,100 tons of stone per mile 5¼ inches thick.

Under a special requirement for this project, stone of the same size was used for both bottom and top, but was put down in two layers. The specification for this stone is as follows:

"Shall all pass a screen with circular openings of 1¾ inches; not less than 40 nor more than 80 per cent shall pass a screen with ¾-inch circular openings; and not more than 35 per cent of the material shall pass a screen with ¼-inch openings."

Codell Construction Company, Winchester, Ky. Successful Bidder on String of Road Projects Whose Names Sound Like a Football Signal 68, 96, 3180, 3047A-B, 159-A, and 160-A

Quantities and Unit Prices

The total quantities of stone in this contract by sizes were: base course stone, top course stone, 47,725 tons. The contract price for the stone was $2.68 a ton as weighed at the quarry by a State highway representative. There were 127,776 lineal feet shaping shoulders at $.04, and the total contract price for the group of projects was $133,014.04.

Two Quarry Set-Ups

The contractor found a very good ledge of sandstone at a point about 7.5 miles from Swiss and a second quarry about 5 miles west of Summersville. Summersville is located about 21 miles east of Swiss. There was a break in the string of contracts north of Summersville where a stretch of improved road had been completed.

From the first quarry, stone was hauled the 7.5 miles toward Swiss and for 5 miles toward Summersville. Then from the second location the stone was handled for the remainder of the work. All hauling was done by subcontract, awarded to Crane & Co., of Toledo, Ohio. There was a maximum of seven 3½-ton Mack trucks with dual pneumatic tires on the rear wheels.

The First Quarry

The two quarry set-ups were practically identical and used the same equipment. The first quarry therefore will be described. The ledge which was opened as a quarry was at the side of the road, and in spite of a narrow right of way at the bins traffic was maintained with little or no delay at all times, even immediately after blasting.

A single Ingersoll-Rand air compressor furnished the air for the two I-R jackhammers which did all the drilling. The face of the quarry was about 40 feet maximum. Holes were drilled to a maximum depth of 18 feet so that the quarry was operated in two lifts. Du Pont 60 per cent gelatine dynamite was used for the shooting, which was done twice a day, at noon and at night, throwing down just enough rock each time to

keep the sledgers busy and not to block up the roadway, which had to be used by the hauling trucks, the Iron Mules feeding the crusher and by through traffic.

Twenty men were used to sledge the rock to a convenient size to be handled by the 1-yard bucket of the Marion 31 steam shovel. The shovel loaded two Bates Iron Mules, which ran the average distance of 200 feet from the quarry to the ramp leading to the feeder hopper of the Telsmith 10A gyratory crusher. Three men fed the stone to the crusher, and the crusher-run material was carried to the cylinder screens over the bins by a continuous bucket elevator. There were four bins for the stone, fines, 1¼ to ¼, 2¾ to 1¼, and oversize. The oversize stone was at first hauled out by one of the Iron Mules and taken back to the crusher, but later when it was found that there was not enough fines being produced by this stone, an Austin-Western chip crusher was installed and fed from the oversize bin. The fines were then run up another bucket elevator and into the cylinder screen. The small crusher was run by a John Deere tractor, while the large crusher, elevators and screen were run by belt from a Frick horizontal boiler and engine.

The trucks hauling the stone to the grade ran past the bins and backed under. After receiving the load they pulled out, turned and stopped on the platform of the Reliance pitless scales, where the contractor was credited with the amount of stone going to the road.

The water for the steam shovel and the boiler was supplied from a creek running alongside the road at the quarry by a Fairbanks-Morse gas pump delivering to a 2-inch iron pipe laid to the shovel and boiler.

THE LABOR ORGANIZATION

The labor for the operation of the entire quarrying and crushing and screening plant consisted of: 1 shovelman and 1 oiler, 2 Iron Mule operators, 2 drillers, 1 powderman, 1 blacksmith and 1 helper, 1 compressor man, 3 men at the crusher, 1 bin man loading trucks, 1 night watchman, who oiled up and greased all machinery, and 1 bookkeeper. This was in addition to the 20 men sledging.

PERSONNEL

These projects were built by the Codell Construction Co., Winchester, Ky., with J. S. Watkins as Superintendent. For the State Road Commission of West Virginia, C. O. Legge was Inspector.

Don't Guess Your Building Costs

THE new Building Estimators' Handbook for builders, contractors, engineers, and superintendents by William Arthur has recently been issued in its 15th edition by the Scientific Book Corporation, 15 E. 26th Street, New York. By the use of this 1,056-page fabrikoid bound volume containing 600 tables and 480 illustrations, it is possible to take the guess out of the cost of doing construction work or the price of the material or supply. The figures and other data in this book apply to all kinds of ordinary building, but in actual quoting of records, greater emphasis has been place upon residences, stores and flats, office buildings, manufacturing buildings, railroad shops of all kinds, and schools. The most valuable feature of the book is the complete set of tables, which cover all phases of estimating in the entire structural field.

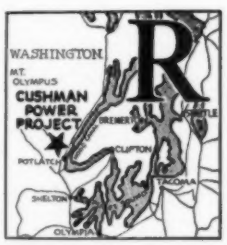
The contents of this Handbook includes measurements of building work; the quantity system of measuring; speed and how it is affected by climate, by hand and machine labor; excavation and fillng; piling and underpinning; concrete work; reinforced concrete, stone, gravel, marble and terra cotta; brickwork; cement stone; structural iron and steel; and the index. The price of the book is $6.00.

ONE OF THE CODELL CONSTRUCTION COMPANY QUARRIES ON ITS 31.5-MILE MACADAM SURFACING CONTRACT

1. *The Marion 31 steam shovel and one of the Bates Iron Mules which hauled rock from the shovel to the crusher.*
2. *The Telsmith crusher, screens and bins for the stone.* 3. *Close-up of an Iron Mule dumping into the hopper above the crusher*

Excavation *and* Concreting *on the* Cushman Power Development

By
W. A. Scott



RAPID progress is being made by the Department of Public Utilities, Tacoma, Wash., on the second stage of the Cushman municipal power development on the North Fork of Skokomish River. This branch of the stream, having an average flow of 800 second-feet, drains a section of the Olympic Mountains and flows southerly into the main river, the latter emptying into Hood Canal, an arm of Puget Sound.

The first stage of the Cushman development, consisting of construction dam and power plant No. 1 and a 40-mile transmission line to the city, was completed in 1926. No. 1 dam was built across Skokomish Canyon just below the foot of Lake Cushman, creating a reservoir of the storage capacity of 440,000 acre-feet of water. The lake referred to was originally an expansion of the North Fork, between mountain spurs. Power plant No. 1, situated 500 feet below the dam, contains two generating units of the combined capacity of 40,000 kva.

Second Stage Development

The second stage of the project, now at the height of construction under several contracts, involves the building of dam No. 2 on the North Fork at a site 1½ miles downstream from dam No. 1; the driving of a power tunnel, 17 feet in diameter and 13,000 feet long; the installation of two steel penstocks, each 10½ feet to 9 feet in diameter and 1,600 feet in length; the building of a Larner differential surge tank, 95 feet high and 65 feet in diameter; and the construction and equipment of power plant No. 2 with a capacity of 60,000 kva.

Installation of Byron Jackson Deep-Well Pumps for Dewatering Pit During Excavation and Concreting

Contract Work in Progress

L. H. Hoffman of Portland, Ore., under a contract amounting to approximately $600,000, is building dam No. 2 and a 120-foot spillway. His work includes the installation of three drum gates over the spillway and the butterfly valves for the two 78-inch outlets through the dam. The Youdall Construction Co. of San Francisco, Calif., to whom the tunnel contract was awarded, has the job well along toward completion. The Western Pipe & Steel Co. of San Francisco, Calif., is installing the two steel penstocks and building the surge tank at the tunnel outlet. Allis-Chalmers Co., Milwaukee, has furnished and is installing the hydraulic turbines and electric generators. Other contracts in force comprise the following: the Commercial Boiler Works, Seattle, for the fabrication of the three 14 x 40-foot spillway gates which are of the type adopted by the U. S. Reclamation Service; Bonnell & Son, Tacoma, for the construction of the concrete and steel building for power plant No. 2, the structure being 81 feet by 180 feet.

Formation at Dam Site

The site for dam No. 2 was explored by Lynch Bros., diamond drill operators, under the direction of J. L. Stannard, Chief Engineer of the project and with the

advise of Ira A. Williams, Consulting Geologist. A sketch of the geologic cross section of the canyon at the dam site shows mostly a massive basaltic lava formation, with some contact zones between different lava flows.

FEATURES OF DAM NO. 2

The concrete dam is designed as an arch, with a 130-foot radius. The length of the curved section, measured at the crest on the upstream face, is 354 feet. That section, at the west end, joins onto a thrust block, 60 feet long, which projects into an excavation in the canyon wall; a similar thrust block at the east end, 54 feet long, locks into an excavated cut on that side. The three sections give 468 feet as the full length of the dam at the crest. The length at the base is only 50 feet. It has a thickness of 40 feet at the base and 8 feet at the crest. The height, when the dam is completed, will be 225 feet above bedrock and 160 feet above the stream bed. This shows there was 65 feet depth of material above bedrock to be excavated.

WORK UNDER L. H. HOFFMAN CONTRACT

This article pertains mostly to the work under the contract of L. H. Hoffman, covering stream diversion, excavation between river bed and rock foundation, the stripping of the canyon walls, and the construction of the dam and spillway, including the handling of material.

The Dam Site Showing the Lower End of the Flume with the Haulage Track at the Right for Disposing of Material Excavated from the River Bed

The Dam Site Showing the Lower End of the Flume

COFFERDAM AND FLUME

The cofferdam and flume for diverting the stream along the right hand side of the canyon was completed in August, 1929. This dam, a timber crib, rock-filled structure, is at a point 500 feet above the main dam and extends 100 feet across the bed of the canyon. Its height is 23 feet above the river bed, the upstream face being finished with two layers of 2-inch planks, placed on a 45-degree slope.

The wooden flume, which has a length of 900 feet, extends along the right bank and empties at a point 400 feet below the main dam. It is 20 feet wide, and has a depth of 14 feet at the intake, the elevation of the flume floor being 10 feet above the river bed at the main dam. The structure is supported on wooden sills that rest mostly upon a narrow berm, but over short sections on trestles. The flume capacity is 3,800 second-feet, which is sufficient to carry the discharges from the turbines in power plant No. 1, and the surplus water passing through dam No. 1.

EXCAVATION FOR DAM NO. 2

The work of excavating at the dam site in order to expose the foundation bedrock, required the handling of 45,000 cubic yards of material. About 20,000 yards of this was taken from the section between the river bed and the solid bedrock, representing a depth of about 65 feet. The other part, amounting to 25,000 yards, was excavated from above the level of the stream bed, resulting mostly from stripping the canyon walls and making cuts in the solid rock of those walls.

The pit material consisted, to a considerable extent, of heavy boulders imbedded in gravel and sand. As the excavation proceeded, the heavy boulders were drilled and broken by blasts so that they could be handled. In the deep pit excavating, within the limited area, no power shovels were used. Instead, all material was lifted and dumped by an American Hoist & Derrick Co. unit, consisting of a derrick equipped with a 100-foot mast and a 90-foot boom, operated by an electric 3-drum hoist, with a swinger attachment. A cable, running from the hoisting drum over the mast sheave, extends thence to the end of the boom, where it connects with a detachable skip of 1½-yard capacity.

The skips, of which 8 were used, were loaded by crews of hand shovelers, working on 8-hour shifts. The gravel and sand were loaded into the skips with shovels, but the heaviest pieces of boulders were loaded by hand. One loaded skip at a time was hooked to the derrick by

which it was hoisted and swung to a point above a track and there automatically dumped into a 4-yard car. To such cars, coupled together, were loaded and hauled 300 to 700 feet downstream, the spoil being dumped along the bank above the track by a Fordson gasoline locomotive. In this operation of excavating, hoisting and disposal of material from 8 to 10 loaded skips per hour were handled, amounting to about 120 yards for each 8-hour shift.

Pouring Concrete in Base of Dam

After the bedrock was uncovered in this way, an upstream cutoff trench 5 feet wide and 8 feet deep, was excavated in solid rock. Grout holes, 2 inches in diameter, were drilled in the trench bottom, and these were piped and subsequently filled with grout under a pressure of 200 pounds per square inch. Excavation of the cutoff wall was extended at both ends into the canyon walls, the cuts continuing up the stripped face of each one. These cuts into the wall faces were 5 feet wide and 5 feet deep, forming anchorages for the concrete thrust blocks of the dam.

The pit excavation for the dam foundation was completed by January 1, 1930. This was followed by stripping the canyon walls of seamy rock which required drilling, blasting, hoisting and disposal of the spoil.

PUMPING FROM THE PIT

The water seepage into the pit during the period of excavating and the first stages of concrete pouring required constant pumping operations. The principal units for this work consisted of three Byron Jackson 12-inch deep-well turbine pumps, each driven by a 75-

View of Dam No. 2 Looking Upstream. At the Right Is the Trough of the Gravity Concrete Placing System Leading from the Mixers to the Distributing Chutes. About 30 Per Cent of the Concrete Was Placed in This Manner

horsepower direct-connected motor, discharging 2,000 gallons per minute into the flume.

CEMENT AND AGGREGATE

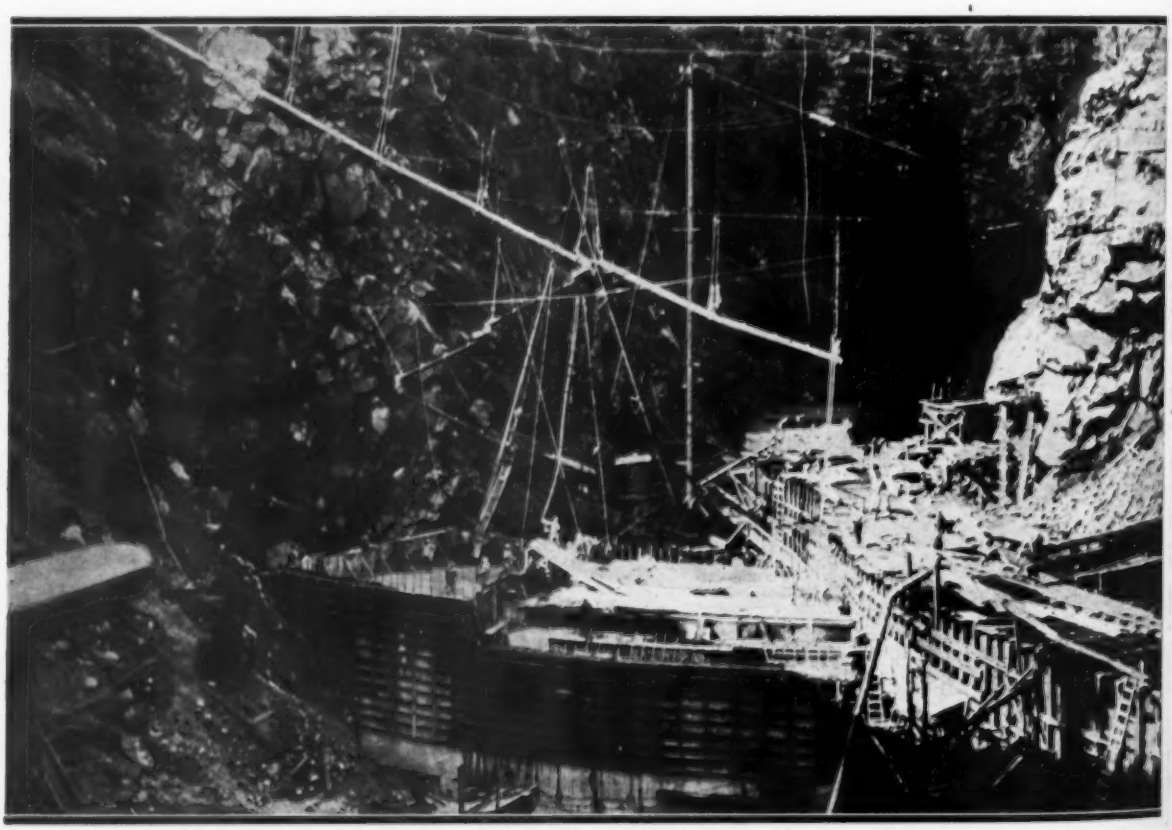
Cement, which is being furnished by the city, is delivered in sacks on barges at Potlatch, on Hood Canal, about 65,000 barrels being required for the dam and spillway jobs. The supply is hauled in trucks from Potlatch to cement sheds on the project, a distance of 4 miles. The sand and gravel, furnished by the Pioneer Sand & Gravel Co., Seattle, is likewise delivered by barges at the Potlatch dock. This stock of different grades is transferred by a dock crane from barges to a loading hopper that discharges into 5-yard trucks of which there are 12 in service here. By these the aggregates are hauled to the project and delivered to storage bins above the mixing plant.

The proportioning of cement and aggregates is by volume. In the mixer batches there is used 1.1 barrels of cement in 1 cubic yard of concrete. The aggregates used consist of sand, plus gravel of several grades from ¼-inch to 3 inches. The mixing plant consists of one Smith and one Rex mixer, each of 28-cubic foot capacity and is located on the left side of the canyon at an elevation above that of the proposed dam crest.

CONCRETE POURING METHODS

Two concrete pouring methods were adopted for the construction of this dam. One of these was the direct gravity method which was used in pouring all concrete from the foundation bedrock up to a level 20 feet above the stream bed, or of the depth of about 85 feet. This part of the work was performed between January 1 and April 20. In connection with this direct gravity plant, the batches of concrete were discharged from the mixers into a trough in which it flowed by gravity into a regulating hopper of the capacity of two batches. Its outflow from this hopper was in a uniform stream down a straight line trough for a distance of 200 feet, to a point where the concrete was passed through distributing chutes to pouring points on the dam. About 30 per cent of the volume of the dam was poured in this way up to June 1.

The other 70 percent is being poured through line chutes from different levels on an Archer tubular steel distributing tower, which was built in June. This tower, erected by the L. H. Hoffman forces, is 6 feet by 6 feet in cross section, and 240 feet high. Its location is on the canyon slope, close to the regulating hopper. The tower is equipped with a motor-driven single drum hoist, operating a skip by means of a cable that runs over a sheave at the top of the tower. The skip holding one mixer batch, is filled by gravity, its contents being dumped into either one of two tower distributing hoppers, each of 40-cubic foot capacity, at different levels. Line chutes from the hoppers lead to the pouring areas of the dam. By means of this tower distributing system, the pouring of concrete is being carried up to the crest of the dam, 140 feet above the level reached by the direct gravity method.



Pouring Concrete in the Stream Bed Section. The Diversion Tunnel Is Shown at the Right and the Line of Suspended Chutes for Carrying Concrete from the Hopper to the Various Parts of the Dam Are Seen Above

THE SPILLWAY

Excavating for the spillway, involved the handling and disposal of 16,000 yards of earth and 10,000 yards of rock. This work is on the right, or east side of the canyon, the method employed consisting of drilling and blasting, and the removal of the material by a dragline and cars to a disposal area. The three 14-foot by 40-foot drum gates to be installed are to be siphon controlled and will be supported by concrete piers.

THE CONTRACTORS' FORCES

L. H. Hoffman, dam and spillway contractor, had a force of 130 men on the entire job while excavation in the pit was in progress, but this was reduced to 80 men after the completion of the pit work. Under an arrangement with the Youdall Construction Co., tunnel contractor, Mr. Hoffman's employees were housed and fed at the Youdall camp.

All drilling and blasting required in connection with the dam and spillway work were performed by Lynch Bros., Seattle, under a subcontract. This concern used two Gardner-Denver motor-driven compressors, each of 600 cubic feet capacity, for operating Gardner air drills, which included jackhammers.

OUTLETS THROUGH DAM

The two main outlets through the dam are at elevation 335, which is at a level of about 70 feet above bedrock. Each outlet, of a diameter of 78 inches, required two Pelton butterfly valves, which are to be installed by the contractor. The outlets are to be protected by trash racks.

POWER TUNNEL INTAKE

The power-tunnel intake, at elevation 450, or 45 feet below the dam crest, will be equipped with a Phillips & Davis control gate, 17 feet by 17 feet, known as the Broome self-closing type. The inlet is to be protected by rack bars and trash racks. This part of the work is under the Youdall Construction Co. contract.

PERSONNEL

In the construction of the dam and spillway, O. F. Sunde is General Superintendent for the contractor, with R. E. Kremers as Engineer, A. P. Dean, Superintendent of Construction and John B. Alexander as Assistant Superintendent.

The Cushman power development is being carried through under the authority of the Tacoma Department of Public Utilities with Ira S. Davisson as Commissioner and J. L. Stannard as Chief Engineer.

Experimental Iron Base and Curb for Brick Paving

AN experimental contract for a pavement with an iron base and curb has been placed for 150 feet of pavement on the Grand Avenue Connection with the Rochester Road near Springfield, Ill. The roadway which was laid in September is the first test of three different designs. The iron base and curb were laid on a levelled highway. The subgrade was carefully rolled and prepared before the iron base and curb was laid. On the base a mastic sand cushion was placed and then a layer of 2½-inch and 3-inch brick with asphaltic filler poured into the interstices between the bricks. The result is what is believed to be an indestructible base with a smooth riding surface built into the structure with sufficient flexibility to meet all changes in temperature without breaks or cracks.

Method of Lapping Metal Plates to Provide for Expansion and Contraction

The iron base consists of three principal sections, one of blue annealed flat sheets and the other two galvanized and corrugated sheets. The corrugations in one 50-foot section are parallel to the road and in the other, transverse. The flat iron base is ¼-inch thick and the corrugated galvanized base is 10-gage.

The blue annealed section is so designed that two sheets laid end to end span the highway. Expansion and contraction in this section is provided for along the center line where the end of one sheet is laid on the edge of the adjoining sheet to provide free movement. One transverse edge is turned down to grip the roadway whereas the other edge lying transverse to the road will be supported upon the adjoining plate section to provide free movement for contraction and expansion. The end of the plate section on the edge of the highway is turned up to form a retaining wall for the brick or other paving material. Turning up the edges of the horizontal sheets gives rigidity. Rigidity is also obtained by the corrugations used in the other two sections.

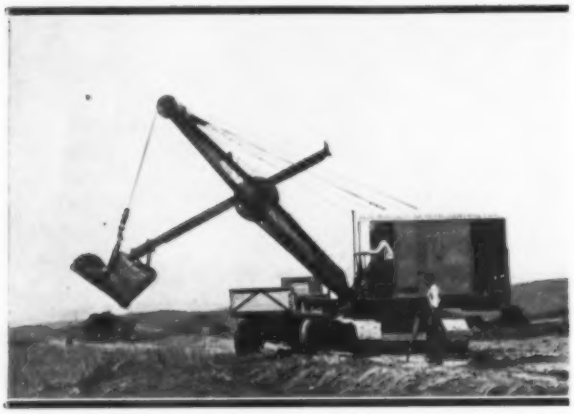
In the section where the corrugations of the galvanized sheets run parallel to the highway, the outer sheet edges will be turned up to retain the brick or other paving material. One edge of each other sheet will be turned down to grip the roadway, while the other edge will be lapped one corrugation on the adjoining sheet. A T-bar will be used under each transverse joint.

Where the corrugations run transversely, an "L," 16 feet 8 inches long, will be welded along the outer edge of the sheet to retain the brick or other paving material. The L is welded on the sheet because of the difficulty experienced in bending the sheet against the corrugations. The sheet ends on the center line of the highway will be laid on a T-bar. One transverse edge of each sheet will be turned down to grip the roadway while the other edge will lap on the adjoining section as explained above.

The three types mentioned above will be tested under actual conditions. If they prove successful under traffic conditions, great progress will have been made in highway construction. Such a roadway will not only be flexible but should eliminate cracking and permanent deformation. The use of rust-resisting materials will insure durability.

The manufacturers and organizations cooperating in this test are the American Rolling Mill Co., which rolled and fabricated the Armco ingot iron base and the Poston-Springfield Brick Co., of Springfield, Ill., which furnished the paving brick. The National Paving Mfrs. Assn., is cooperating in the test.

Saving Money on Grading on a Concrete Paving Contract



The Big Lorain 75 Cleaning Up the Ditches After It Had Completed the Heavy Excavation

Graders Used for Light Cuts and Baker-Maneys for Speed

WHILE many contractors are saying that there is no money in grading a concrete paving job and that they do not begin to make money until the slab is going in, A. A. White, Inc., has shown methods of handling the grading that produce results by using graders for the light cuts and Baker-Maneys where the cuts are a little deeper and a Lorain 75 for the heavy cuts. On the 12,212-foot job between Berwick and Orangeville, Pa., preparing the grade for an 18-foot. 8-6-8-inch section concrete pavement, much was accomplished in spite of poor earth with a 6-foot strata of tough clay, and quicksand along the stream beds.

Excavation

The contract called for 24,384 yards of unclassified excavation which included topsoil that would not compact under the roller on the fills, clay that could not be dug vertically, and quicksand that was 2½ feet deep and covered with 3 feet of water. There was also a small amount of hard shale which did not, however, require any shooting.

Grading was started on May 9 at the Orangeville end of the job and work continued toward Berwick where the batching plant was set up. Similarly the paving was started at the far end and continued through to Berwick. The equipment used included a Galion 12-ton Master gas roller with scarifier, a Caterpillar Thirty with bulldozer, and a Caterpillar Thirty and a Sixty pulling the trains of Baker-Maneys, the Lakewood graderooter, a Galion Buster and a Galion No. 10 grader. A Lorain 75A gas shovel of 1¼-yards capacity loaded the hired trucks and the Hughes-Keenan 2-yard Iron Mule. The trucks were from 2½ to 5-ton capacity and all were equipped with dual pneumatic tires on the rear wheels. These International, White and Mack trucks were hired by the hour.

The maximum fill was 13 feet and the maximum cut the same while the average haul on the job was 1,000 feet with a maximum of ¾-mile. On the straight-away cuts where the power shovel was used the boom was long enough for the shovel to cut a swath wide enough so that a truck could drive in on either side of the shovel, one parking while the other was being loaded. This greatly speeded up the loading as the shovel did not have to wait a minute for a truck. The fill was dumped and spread in 4-inch layers by the grader and then rolled. The topsoil was so spongy that in spite of the thin layers, only one-half the usual State specified thickness of 8 inches was spread at one time before rolling. The trucks driving over the new fill with loads compressed it 4 or 5 inches on a 3-foot fill. This was corrected before the final topping was placed and the whole fill stabilized.

There was about 1,000 feet of cut about 2 feet deep that was handled quickly and economically with the Caterpillar and grader. The earth was bladed to the center and picked up by the 1¼-yard Baker-Maney scoops and carried to the fills.

Quicksand

Quicksand caused no end of trouble on this job. There was a 2½-foot layer of quicksand along the stream that ran by the job, covered with about 3 feet of water. At the point where the double span 30-foot bridge was

located the shovel was run across on mats. The quicksand was underlaid with shale at some points and in the stream bed which was cut to replace the old channel which came along the center line of the road, the underlying stratum was gravel.

TOUGH CLAY

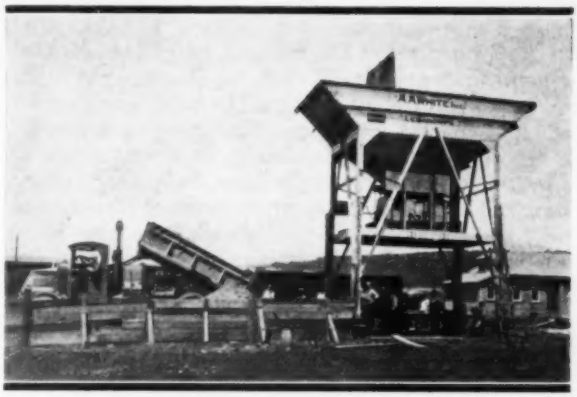
On one of the deep cuts the shovel loaded 900 yards in 10 hours. At another of the heavy cuts there was a stratum of clay that would not break up for the shovel. It was thought that it might be necessary to resort to explosives but finally the problem was solved by undercutting the stratum. When the shovel tried to dig a straight face it was slowed down but the undercutting made speed possible.

FINE GRADING A SIMPLE OPERATION

Believing that the place to get the proper elevation for the grade is with the rough grade crew there was not much left for the fine grade except to smooth off the subgrade and take off a few high spots. A crew of 10 men and a foreman and a tractor and blade grader were about all that were needed. Where there was a mistake in the rough grade and one or two cuts up to 1½ feet had to be made a Baker-Maney was sent back and the error remedied in short order.

A MINIMUM FORM SETTING CREW

To set the 9-inch Truscon steel forms only three men were used and a second crew of three just ahead of the paver to realign the forms and reset those removed for the trucks to turn through to back to the paver. The fine grade crew dug the trenches for the forms by hand. The contractor had considered a form trench machine but had not purchased one. He felt that although the costs were about the same that the machine probably gave better bearing for the forms and as the bearing of the base of the forms is the real determining factor in the riding quality of the road there should be real incentive for any conscientious contractor to invest. While the forms may be in true line vertically when they



Setting Up the Butler Bin and Batcher "Irene" and Starting the Stockpile

are set, the heavy finishing machine is bound to depress them in running over them where the base is not uniformly supported and hence the bumps that the irate taxpayer notes and blames on everything but the real cause.

"IRENE"—THE BATCHER PLANT

Starting with a joke the whole organization named the various pieces of equipment. One of the shovels is named for the wife of the Vice President, a crane at the batcher plant for the wife of the President and then there was a bit of humor that led to the Butler bin and batcher being named "Irene." Unfortunately the story cannot be told here but it is a real good construction gang yarn. Each piece of equipment has its name neatly painted on it in a conspicuous place.

The batcher was set up in Berwick, Pa., on a Pennsylvania Railroad siding giving a dead haul of about 1.3 miles and an average haul for the entire job of about 3.0 miles. The batcher man is justly proud of his record of weighing and dumping three complete batches into a single truck in 45 seconds. The batches were made up of 1,236 pounds of sand and 1,992 pounds of

A Caterpillar Sixty with Galion Big Buster Working on the Subgrade

stone. Sand was trucked 13 miles from the Salem Sand & Gravel Co. plant at Shickshinny, Pa. and the crushed stone was received by rail from the Susquehanna Stone Co. quarry at Dalmatia, Pa. The sand was dumped onto a stockpile at one side of the batcher on a flooring of boards with the trucks running up onto the pile as it was increased in size. The stone was unloaded from the gondola cars by a Lorain 55 crane with a 45-foot boom and a Hayward ¾-yard clamshell bucket. There were two men in the cars cleaning up, a crane man, and a batcher man who kept the chart for the trucks showing the time and number of each truck as it left the plant.

No cement shed was erected, the six bags of cement being loaded directly from the freight cars onto the batches by two men. The cement was received on 24-hour delivery from the Allentown Portland Cement Co. plant at Catasqua, Pa. The stone was received on a 24-hour delivery.

CONCRETE POURED FULL 18-FOOT WIDTH

Only a few contractors in Pennsylvania pour the 18 or 20-foot pavements in two strips, and those who do are usually those who have had some experience with the narrow strips in other states. On this job the concrete was poured the full 18 feet. One man was kept ahead oiling the forms and when not busy with that he put out the joint pads for the joints, laid out the dowels for the center joint and saw that the bags of Dow calcium chloride were distributed along the grade ready for the man on the paver to put into the solution tanks. Three men dumped the cement on the batches dividing the cutting and dumping operations among themselves as convenient. One man on the grade gathered up the bags and baled them at once after inspecting them to see that they were acceptable for return. One man dumped the trucks and saw that the batches came out clean. This contractor makes a practice of reversing the trucks at the batcher going in frontwards one time and backing in the next so that the stone will have a chance to clean out the sand and not have a wet spot in one place on the bottom of the truck for the sand and cement to stick to and make spading necessary at the paver. On the Koehring 27-E paver there was the operator who ran, greased and oiled the machine and the calcium chloride man operating the Burkett automatic dosing device.

The Aldrich Pump Which Faithfully Supplied Water for All the Concreting

The New Stream Bed and the Site of the Old Along the Center Line of the New Fill for the Road Seen at the Right

There were four men in the pit and two spaders who also put in the steel. For the Lakewood screen one operator and two men to shovel to the strike-off were provided. Following the finishing machine were the two surface finishers who handled the long-handled lutes or floats, the straight-edging, and the final burlap drag as well as the edging. After the surface was finished the Heltzel cleft center plane machine came along and cut the slot for the premoulded center joint, which was inserted and finished by one man and a helper. There were two men placing the burlap and one man to sprinkle the day's run.

THE UTILITY CREW

Important on any job is the way the small things are handled so that the big end of the job will not be held up. On this contract a utility crew started out at two each morning and by six had the forms from the previous day's run ahead ready for the form setters. The crew consisted of the truck driver, who was the foreman, and 6 laborers. After six in the morning this same crew loaded up with the Truscon welded reinforcing mesh and distributed it along the shoulders. As the form setters kept the forms about 800 feet ahead of the paver the utility crew had the forms and the welded Barmat ready a little farther ahead each day. There were 3,000 feet of forms on the job and the average pour was between 800 and 900 feet.

THE WATER SUPPLY

The Aldrich triplex pump with a Hercules engine was set up adjacent to one of the bridges on the contract about ¼-mile from the north end of the job. Two-inch pipe with screw couplings was used with taps every 300 feet. A 175-foot hose was used on the paver.

A novel device was used on the paver connection to protect the three-way valve of the water measuring tank. A screen was inserted in the line to check any scale from the pipe getting under the valve and causing the water to flow too freely or too scantly. The paver operator would of course catch a batch that was too dry or too wet but the contractor was taking no chances that even one batch would be lost through this trouble.

PERSONNEL

A. A. White, Inc., of Lebanon, Pa., was the contractor for this project. After the completion of an earlier contract at Lewisburg, Pa., R. L. Davis, President of the company, handled all the grading and S. H. Brown, Vice President, was in charge of concreting. For the State Department of Highways, C. S. Monroe was Chief Inspector.

Crushed Gravel

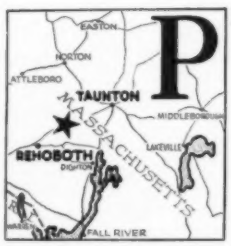
for

Aggregate

in

Massachusetts

A 7.12-Mile Concrete Job Near Taunton Built by Sherry Construction Company With All Aggregate from Own Gravel Pit



PROTECTION of the subgrade of concrete pavements from the action of frost in winter is the reason that Massachusetts has had so little trouble with the heaving of her newer concrete roads. If there is any question as to the condition of the subgrade and its likelihood of holding water there is a 12-inch gravel base spread and rolled on the foundation to hold in check any tendency for capillarity to draw water up into the subgrade and cause trouble in the spring. The work of the Sherry Construction Co., on the 37,600-foot concrete road between Reboboth and Taunton, Mass., included the spreading of this insulating layer.

Having had work in this section last year the contractor had purchased a large gravel pit and opened it for supplying the crushed gravel and sand for the concrete. The pit was located 5½ miles dead haul from the job giving a 12½-mile haul for the maximum batch delivered. Actual work was started April 3 on clearing and grubbing and the grading on April 10, 1930. The concreting was started June 6, at the Taunton end giving the minimum haul for the batches at the start. Then, as the concrete was ready for opening to traffic, the batch trucks had the advantage of better hauling conditions.

Traffic was maintained over the road at all times with flagmen and one-way traffic when necessary. The slab was laid in two 10-foot strips of a uniform 8-inch thickness.

Heavy Haul on Grading

As the excavation was in excess of fill at both ends of the project the hauls were unusually long, running to nearly 3 miles as the excess excavation was used where there was deficiency of material at Dighton near the middle of the work. Three Erie steam shovels, all B-2 outfits, were used on excavation with 3 or 4 hired trucks per shovel. The total excavation ran in the neighborhood of 34,000 yards, of which 32,500 yards went into embankment leaving about 1,500 yards of waste.

The fills were spread by hand with 2 or 3 men on each dump per shovel. On the fine grade the contractor used a Warco Road Hog one-man grader and a Buffalo-Springfield 10-ton steam roller for compacting the fill. When work was at its height placing the 48,000 yards of gravel base 12 inches thick two of the graders were used with two rollers. The base was spread in two layers of 6 inches and each rolled. As the fill was very dry due to the absence of rain the fills were not easy to compact. For hand labor there were two men working with each grader outfit.

There were about 8,000 yards of rock excavation on the job which required the use of two I-R compressors, one of which was mounted on a truck. The maximum holes drilled were 15 feet deep and they were blown with 60 per cent du Pont dynamite.

Form Setting and Final Grade Gangs United

One foreman worked the group of men that handled the setting of the Metaforms and the completion of the final grade for the slab. From 5 to 7 men were used

for form setting with several back after the setting was completed to handle the touching up of the grade. A Buffalo-Springfield 10-ton gas roller was kept between the forms and another of the same size on the shoulders.

Just ahead of the paver were two men who handled the realigning of the forms and resetting the forms removed for the breeches through which the trucks turned. The openings for the trucks were made at intervals of about 250 feet.

THE SAND PIT

For a large job the previous year the contractor had purchased and operated a large sand pit in Raynham 5½ miles beyond the end of the present job which for this work required that all the trucks pass through the center of Taunton on every trip both ways. The size of the operation and the excellence of the sand and gravel were the factors that led the contractor to use this pit even though the hauling conditions, as far as traffic were concerned, were not of the best.

The pit, 40 acres in extent, was operated with an Erie steam shovel loading two trucks in the various parts where the mixture of sand and gravel were of the best proportions for the concrete. The trucks hauled the loads to a ramp and dumped through an 18-inch opening into the 12 x 16-inch Acme jaw crusher. The crushed material went through to the pit where it was picked up by the bucket elevator of the Good Roads washing plant and carried to the top. After passing through the washing process the material was screened and run to the compartments of the large steel bin which was set up to permit considerable storage for the washed material. The sand and crushed gravel for the batching plant were hauled from the bins to two stock piles by trucks and then loaded into the Erie Aggre-Meter weighing batcher plant bins by an Erie steam crane having a 45-foot boom and a ¾-yard clamshell bucket.

Nine 4-batch hired trucks and three 3-batch trucks owned by the contractor were used for hauling the batches. The individual batches were 1,970 pounds of stone and 1,000 pounds of sand with the 6 bags of cement.

The trucks backed under the batcher and received their loads in quick time and drove ahead about 200 feet to the large cement storage shed and platform where 6 bags of Lehigh cement were tossed onto each batch by three men from the platform. The cement was all hauled from a railroad siding about one mile from the plant by trucks and loaded into the cement house and then out again onto the batches. There was an opportunity to load the trucks at the point where the road leading to the plant and the main road up which the cement trucks had to come. By putting the cement onto the batches at this point under ordinary conditions would have cut the haul of the cement in half.

POURING THE SLAB

As the trucks backed to the paver skip two men climbed aboard and emptied the cement from the bags into the batches in the trucks tossing the bags out onto the shoulder to be collected at the end of the day. Two men were kept busy on the shoulder well ahead of the form setting gang making up the reinforcing mats with steel rods set into a frame and then wired together. The mats were stored on the shoulder until needed and were well strung out for ease of use.

At the paver, a Ransome 27-E, just before the concrete was poured, there was one man who sprinkled the grade and also helped place the reinforcing steel and placing the bulkhead. This same man also cleaned up any spilled concrete from beneath the paver bucket and saw to it that any slight depressions left by the truck tires were filled in before concreting. An average of 325 to 330 cubic yards of concrete was poured per 10-hour day.

The reinforcing steel which was placed by the helper mentioned above and another man who did nothing but place steel and bulkheads and one man from the pit crew, was supported above the subgrade by two 2-inch pipes dragged behind the paver and placed about 2 feet out from the forms which were 12 feet apart. The mat had a tendency to sag in the center and touch the grade but this was generally overcome by the men standing on the mat outside of the pipes and the cantilever action raised the mat sufficiently for the concrete to flow underneath and support the mat. Where there was any chance of the mat being low it was lifted by hooks. This method which is condemned by the Portland Cement Association as tending to cause a plane of weakness along the line of the pipes, seemed to work out well as far as production of slab was concerned, was preferred by the contractor to the New Jersey method of striking off the concrete 2 inches below the top of the form with a hand strike-off and then placing the steel.

The reinforcing mat was made up of bars of a cross-section of ½ square inch with 3 bars spaced 1 foot apart along the outside of the slab and 2 bars spaced one foot apart along the center. There was one intermediate bar spaced 3 feet 3 inches from the other groups. Other reinforcing provided included the dowels running across from adjacent slabs and running transverse of the pavement. These were bent at right angles and set every 5 feet against the form and then bent out when the second slab was being poured. At the corners of the slabs when expansion joints were inserted corner bars bent at right angles were set 3 inches from the bulkhead and 3 inches from the forms. They were placed about 2 inches from the top of the concrete.

EXPANSION JOINTS

Expansion joints were set every 57 feet in the slab using steel bulkheads set by three men and held by 2 pins on the paver side. Four plain dowels were set through the bulkhead and the Johns-Manville expansion joint and painted on one end with asphalt over which was placed a paper tube to give free expansion. The expansion joint was set with an unequal-leg cap, the longer leg being toward the concrete and away from the paver. This was added protection to the joint material preventing the concrete from working up onto the joint. The cap was removed before the finishing machine ran over the joint.

THE PIT AND FINISHING CREW

There were four men in the pit all of whom shovelled

to the strike-off of the Ord finisher. One of the pit men ran the finisher. There were two hand finishers who used the canvas belt, checked the slab with the Lakewood straight-edge and then put on the rough finish with a fiber broom. The contractor felt that the use of a steel bristle broom was better as it lasted longer, one steel broom having lasted a whole season and this job having worn out a half dozen fiber brooms before completion. A helper for the finishers swept off the slab when the second strip was being poured thus keeping the pair clean and making it easier for the edgers who did not have to watch where they tossed any concrete that was in excess of the needs for finishing.

CURING

The contractor used Solvay calcium chloride for curing, placing it after the burlap which was spread by the same man who handled the chloride machine. Immediately after the finishers were through the burlap was spread and sprinkled for the remainder of the day and kept in place over night. Then in the morning it was removed and the chloride man spread calcium chloride with a one-man spreading machine. This completed the curing process, the chloride taking sufficient water from the air to complete the hydration of the cement.

WATER SUPPLY

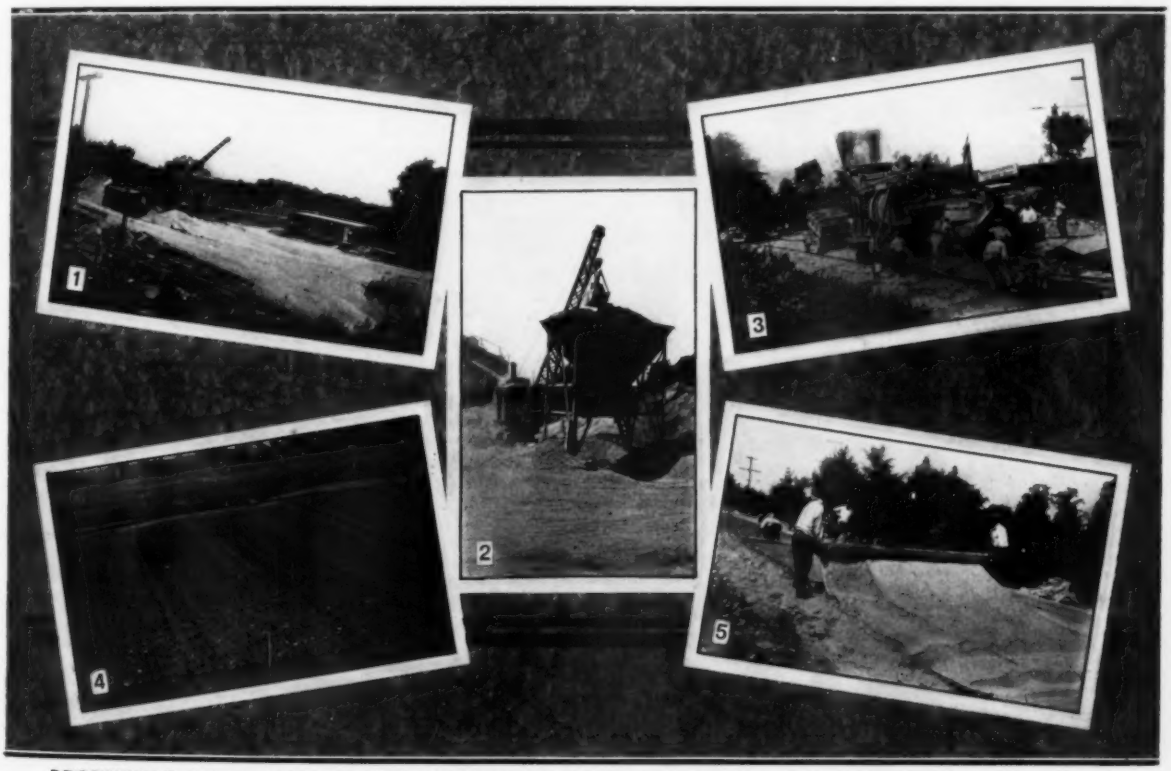
The Segregansett River, which ran by the job, furnished the water for all the paving, wetting down of the subgrade, sprinkling and the shovels. A Barnes triplex pump was used with a 2-inch supply line run along the shoulder. Taps for the paver hose were inserted every 300 feet and the paver carried about 300 feet of hose.

PERSONNEL

Arthur Kappler was Superintendent for the contractor, the Sherry Construction Co., of Fall River, Mass., which employed a maximum of 158 men on this job. G. E. Foster was Project Engineer for the Massachusetts Department of Public Works.

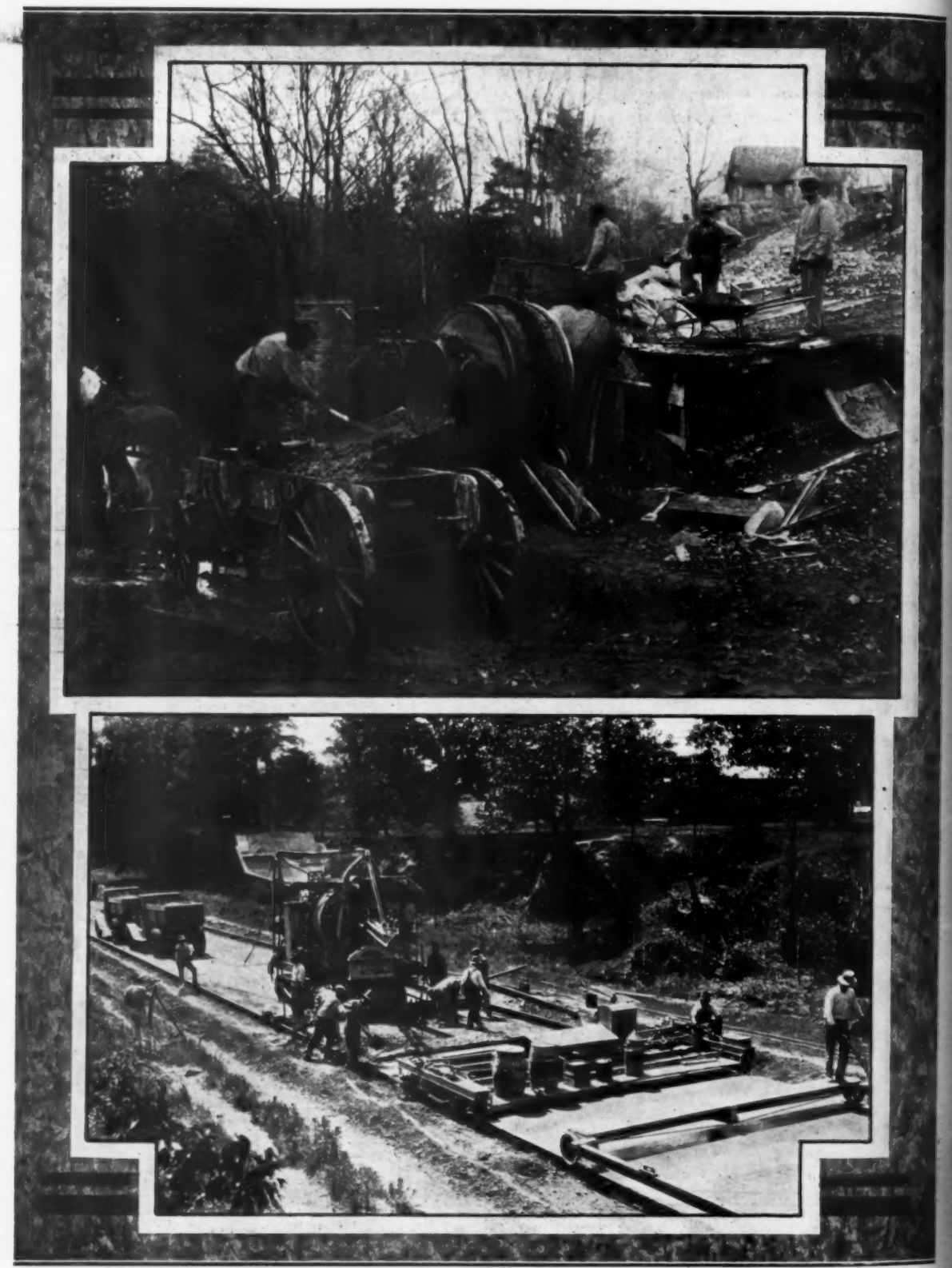
First Contract for Boulder Dam Project Awarded

BOULDER DAM has at last become a real construction job, instead of merely a gigantic "project" with the award of the first contract to an individual concern let the Merritt-Chapman & Scott Corp., New York. This initial job calls for the construction of a 22.17-mile railroad to within 7 miles of the dam site, according to R. L. Adamson, Chief Engineer, Union Pacific system, who awarded the contract. The project is located in Black Canyon, about 25 miles southeast of Las Vegas, Nev. By November 400 men will be at work.



PRODUCING AND BATCHING THE AGGREGATE AND THE FINISHING SLAB ON THE SHERRY CONSTRUCTION CO. JOB AT REHOBOTH, MASS.

1. From left to right, a Bucyrus-Erie crane, the Erie AggreMeter batching plant and the cement shed. In the foreground is the wash water trough from the sand and gravel washing plant. 2. The batching plant with the washing plant in the background. 3. There was much activity centered around the Ransome 27-E paver as it poured nearly 330 cubic yards of concrete each 10-hour day. 4. The broom-finished surface showing the calcium chloride applied for curing the concrete. 5. Spreading burlap over the finished surface from a handy roll



THE OLD AND NEW IN CONCRETE ROAD CONSTRUCTION

Above. An early concrete mixer with horse and wagon for delivery of the concrete, a clumsy combination. Below. The modern concrete mixer has increased the speed of production and reduced hand labor to a minimum. Note the accessories of mechanical finisher carrying supplies and the longitudinal float being used at the extreme right. Photographs courtesy of the U. S. Bureau of Public Roads

A Section of
CONTRACTORS
AND
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Devoted to
News of Consultants
in the
Civil Engineering Field

The Consulting Engineer

October, 1930
New York
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The International Hygiene Exhibition at Dresden

Report of Edgar B. Kay, Consulting Engineer, Washington, D. C.

THE first International Hygiene Exhibition at Dresden, Germany, held in 1911, was designed to educate the public in hygienic methods of living and to present a comprehensive picture of what had been accomplished in the field of hygiene at that time.

From this exhibition the Deutsches Hygiene Museum was evolved which was the pioneer in bringing hygienic instruction to the masses of the people and in pointing the way for further advances along that line.

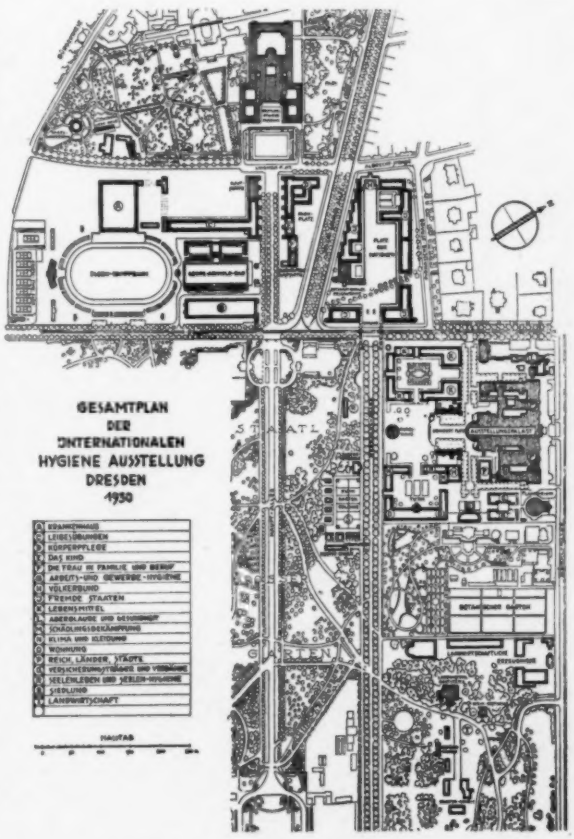
"Health is man's most precious treasure and the most valuable asset of a people. It means happy life for the individual, strength and might for the nation, and yet, though these are commonplaces, comparatively few people translate them into deed by taking care of their health. This fact makes it urgently necessary to educate the masses in hygienic living. They must be taught to observe the rules of healthful methods of life, and above all they must learn to know their own bodies, for only he who has acquired that knowledge can take proper care of his body."

This was the central thought dominating Dr. Lingner, creator of the International Hygiene Exhibition and of the Deutsches Hygiene Museum. A practicable way had to be found to contend against indolence and indifference. This way was found in the novel character of the exhibition of 1911. The exhibition was made up of numerous graphic and plastic exhibits and working models designed to induce the visitors to handle the exhibits and make experiments with them. The aim was to convey to every one attending the exhibition the most important things concerning the human body—its organs, their functions and their relations to each other—and to do this without seeming to teach. The tremendous success of the exhibition of 1911, and particularly the great interest attracted by the exhibit "Der Mensch" (Man), proved that this basic idea was the correct one. Both in Germany and abroad extraordinarily favorable results have attended the travelling exhibitions of the Deutsches Hygiene Museum, working along the same lines.

The Deutsches Hygiene Museum is organized as a "registered association" under the designation "Deutsches Hygiene-Museum e. V." To this association belong representatives of the national government, the State of Saxony, the German states, the City of Dresden and most of the other German cities, as well as various cultural organizations, benevolent associations, insurance companies and other organizations."

With the help of the Deutsches Reich, the State of Saxony and the City of Dresden, a handsome fireproof

(*Continued on page* 84)



A Plot of the 1930 *Exhibition Grounds*

The Consulting Engineer

A Section of

Contractors and Engineers Monthly

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Contents

Alvord, Burdick & Howson, Chicago Ill.	82
American Engineering Council, New York, N. Y.	84
Asphalt Institute, New York, N. Y.	83
V. L. Conrad, Brownsville, Texas	82
Elmer L. Ferguson, Sioux City, Iowa	83
H. K. Ferguson Co., Cleveland, Ohio	83
D. M. Forester, Jackson, Miss.	82
David Gutman, New York, N. Y.	82
Edgar Boyd Kay, Washington, D. C.	81
Lockwood Greene Engineers, Inc., New York, N. Y.	82
Montgomery & Ward, Wichita Falls, Texas	83
William S. Moore, South Bend, Ind.	84
John R. Nichols, Boston, Mass.	82
W. F. Reichardt, Watertown, Wis.	82
Sanborn & Bogert, New York, N. Y.	83
Edward G. Sheibley, San Francisco, Calif.	82
T. J. Wilkerson, Beaver Falls, Penna.	82

Various Building Projects by New York Engineers

CONSTRUCTION on a number of building projects throughout the country is being carried on under the supervision of LOCKWOOD GREENE ENGINEERS, INC., 100 East 42nd St., New York. These projects include manufacturing buildings for the Trenton Potteries Co., Trenton, N. J.; Scott & Williams, Laconia, N. H., and a power house for the Wayne Knitting Mills, Fort Wayne, Ind. Manufacturing and office buildings for the U. S. Rubber Co., Passaic, N. J., and the Fostoria Glass Co., Moundsville, W. Va., and a service building for Firestone Tire & Rubber Co., at Pittsburgh, Penna., were recently completed by this company.

Officers of Lockwood Greene Engineers are Albert L. Scott, President; C. S. Allen, S. B. Lincoln and R. E. Barnwell, Vice Presidents; and F. S. Harris, Treasurer. This company also acts as Consulting Engineers for the All Russan Textile Syndcate.

Consulting Briefs

Alvord Burdick & Howson, Civic Opera Building, Chicago, Ill., are working on plans and reports for a new water works for Aberdeen, S. D.; a water softening plant for Western Springs, Ill.; and an enlargement of the water softening and iron removal plant for Benton Harbor, Mich. Construction of a $1,000,000 sewage disposal and flood relief project for Galesburg, Ill., Sanitary District, the $400,000 intercepting sewers for Racine, Wis., and a 12,000,000-gallon pumping and water softening plant at Cedar Rapids, Iowa, at a cost of $700,000, is being carried on under the supervision of this firm.

John R. Nichols, 45 Newbury Street, Boston, Mass., is engaged in preparing structural plans for the Jackson Memorial Building of the Boston Floating Hospital.

V. L. Conrad, Brownsville, Texas, is preparing plans for the Fort Isabel-Padre Island Bridge, Irrigation Districts No. 8, No. 10 and also No. 11 extension and the Brownsville Navigation District. Mr. Conrad was recently called as expert witness in a law suit over damages to land due to a ship channel.

Col. W. F. Reichardt

Col. W. F. Reichardt, Consulting Engineer, Watertown, Wisconsin, has just completed a 5-mile paving project in the City of Columbus, Wisconsin, at a cost of $120,000. Booth & Olson, Sioux City, Iowa was the contractor. With the completion of this contract which covered 64,000 square yards of reinforced concrete pavement on city streets, practically every street in the entire city is now paved with either reinforced concrete, asphalt on concrete base or vitrified brick on a concrete base. The city now has approximately 10 miles of modern permanent paving.

Edward G. Sheibley, 594 Market Street, San Francisco, California, has been elected 1930-31 President of the San Francisco Section of the American Society of Mechanical Engineers. Sheibley is also a member of the American Society of Civil Engineers.

D. M. Forester, 201 N. Lamar Street, Jackson, Miss., recently joined the staff of the Seabrook Engineering Corp., New York City, and has gone to Moscow, Russia, to act as Asphalt Engineer for the U. S. S. R. and the Seabrook Engineering Corp. Mr. Forester is a member of the American Society of Civil Engineers.

T. J. Wilkerson, P. O. Box 444, Beaver Falls, Penna., supervised the design and construction of the recently completed bridge over the Ohio River between Rochester and Monaca for Beaver County.

David Gutman, Structural Engineer, 100 East 45th Street, New York, is designing the foundations and framework of a 19-story apartment house, 92nd St. and Central Park West; a 19-story apartment house, Christopher St., 7th Ave. and West 4th St.; a 19-story apartment house, West 72nd St. and First Ave.; and a 15-story apartment house, Greenwich and Christopher Sts., all in New York.

Reports on Drainage Districts Prepared by Iowa Engineer

Elmer L. Ferguson

AMONG the work now being carried on in the office of ELMER L. FERGUSON, Consulting Engineer, 512 United Bank Building, Sioux City, Iowa, is the final report for the Lower Lakeport Drainage District, Woodbury County, Iowa; a preliminary report for the Reynold's Creek Drainage District, Woodbury County, Iowa, and a complete survey of the Sioux City Stock Yards Co. real estate holdings.

Mr. Ferguson is also supervising some private drainage work, consisting of cleaning out 3 miles of ditches for L. R. Manley and George E. Ward, owners; a clean-out of laterals in the Garretson Drainage District; the repair of levees in the Wolf Creek Drainage District, Woodbury County, Iowa, and the construction of a sanitary sewer and gravelled driveways for Briar Cliff College, Sioux City, Iowa, in cooperation with George Hilgers, Architect.

Cleveland Firm Taken Over by International Engineers and Builders

THE business, assets and good will of WARREN D. SPENGLER, INC., consulting power plant engineers, Cleveland, Ohio, has been taken over by the H. K. FERGUSON Co., international engineers and builders, also of Cleveland. The Spengler organization was established eleven years ago by Warren D. Spengler and during the history of the company, has been retained by several large utilities and industrial concerns to study and develop means of attaining more economical operation of their properties.

The entire personnel of Warren D. Spengler, Inc., joined the H. K. Ferguson Co., maintaining under new leadership the same activities as in the past, plus the complete construction and equipment service which the Ferguson company maintains.

This is the second nationally known engineering concern which has joined the H. K. Ferguson Co. recently, the other being the De Vore Engineering Co., Toledo, Ohio, specialists in the design and layout of glass plants and paper mills. It is the intention of the Ferguson officials to place their service on an ever broadening basis so that their clients may obtain complete answers to their problems within one organization combining architectural, engineering and construction service.

The Application of Research to the Design of Asphalt Paving Mixtures

SPECIFICATIONS for asphalt paving mixtures are usually quite detailed in character and contain such a wide range of limitations and proportions as to make the adoption of any specific formula within these limitations a matter of expert judgment. Specifications for the individual constituents of the paving mixtures are also often quite detailed, and so tend to obscure the basic principles of design that the entire subject is apt to be confusing to the engineer to say nothing of the contractor who has not specialized in asphalt paving construction.

THE ASPHALT INSTITUTE, Crystal Building, 43rd Street and Second Avenue, New York, N. Y., has published in pamphlet form a paper which takes up the principles of design, stability and related tests and the application of the test results to design. This paper was originally presented by Prevost Hubbard, Chemical Engineer of the Asphalt Institute, before the Engineers Club in Philadelphia. The pamphlet also contains other closely related papers prepared especially for the Asphalt Institute.

Municipal Projects in Texas

THE City of Pampa, Texas, recently engaged the firm of MONTGOMERY & WARD, 545 Harvey-Sniders Bldg., Wichita Falls, Texas, to prepare a complete city plan to be submitted not later than February 1, 1931. This company has also been engaged by the City of Pecos to appraise the water works system which is privately owned. Montgomery & Ward have already completed five appraisals of publicity utility properties this year.

Other projects include 35 blocks of street paving for Hereford; 52,000 square yards of paving for Perryton; water and sewer improvements, Levelland; eight blocks of reinforced concrete pavement for Grand Saline; reinforced concrete paving for Mt. Vernon; brick and asphalt street paving, Spearman and reinforced concrete paving for Hale Center.

Water and Sewerage Projects in New York

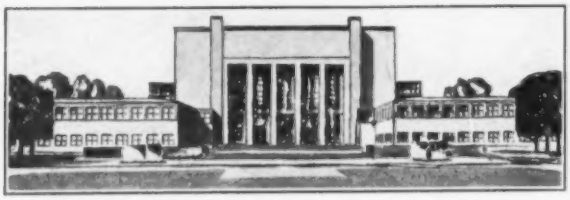
James F. Sanborn

PLANS now being prepared in the office of SANBORN AND BOGERT, 30 Church Street, New York, include those for additional water supply for Long Beach, L. I., new water supply and sewers for Millbrook, N. Y., improved water supply for Kingston, N. Y., a sewerage system for Darien, Conn., and a new water supply for Hampton Bays, L. I.

The construction of Martello Tower for the water supply for Scarsdale, N. Y., a water system for North Castle, N. Y., a dam for the Hackensack Golf Club, Oradell, N. J., sewage treatment works for East Paterson, N. J., water supply for Kingston, N. Y., and various other water and sewer projects is being carried on under the supervision of this firm.

C. D. Bogert

This company was recently called by the Boston Metropolitan District as expert witness in the case of the State of Connecticut vs. the Commonwealth of Massachusetts in regard to diversion of water.



The New Deutsches Hygiene Museum

The International Hygiene Exhibition

(*Continued from page* 81)

building has been erected as a worthy home for the Deutsches Hygiene Museum in a beautiful location in the heart of Dresden. The corner-stone was laid on October 8, 1927, and the opening of the museum occurred during the month of May this year. A number of the Museum's new groups have been assembled with the help of the most modern methods evolved from scientific research and in exposition technique and are on public exhibition for the first time.

The scientific and technical force permanently employed in this building in the preparation of models number at the present time about 225. Models from the workshops of this wonderful museum are now being sent for educational purposes to all parts of the world.

Following an invitation extended by the Directors of the 1930 International Hygiene Exhibition at Dresden to the American Public Health Association to form a delegation to visit this exposition, 121 persons availed themselves of the opportunity to join the delegation.

The International Hygiene Exhibition of 1930 was held in connection with other exhibitions that are held every year in Dresden. Official support was provided from the State of Saxony and also from the City of Dresden, whose exposition grounds in the "Grosser Garten" have an area of 148,300 square yards. In addition to this there are grounds with an area of more than 280,000 square yards and with roofed halls having a floor space of nearly 42,000 square yards.

Twenty-one nations were represented at this exposition with separate displays, chiefly illustrating the work in the various countries being accomplished in the field of public health. The United States' exhibit, for unknown reasons, was pitifully meager and unworthy of our country.

Public health meetings of various kinds were in session in Dresden throughout the summer, but there was no Congress of Health officials at the Exposition at the time of the visit of the delegation of the American Public Health Association.

It is not necessary to say anything about Dresden as an exhibition city, for the Saxon capital is well known as one of Germany's internationally famed tourist cities. Its reputation as a center of art, its splendidly preserved picture of old German baroque, and its whole unique culture adapt it perfectly to the home of a permanent exhibition designed to achieve its effect not by gigantic proportions, but by quality and intensive selection.

William S. Moore, 210 Union Trust Building, South Bend, Ind., and the Burns & McDonnell Engineering Co., Kansas City, Mo., have been retained by the City of South Bend to make a sanitary survey with special reference to sewage disposal.

Engineering Societies Protest Solicitation of Bids from Consulting Engineers for Professional Work

THE soliciting of bids from engineers by cities and corporations has aroused protests from engineering bodies, according to the American Engineering Council. The requirement of some municipalities that engineers post bonds for the faithful performance of contracts is also condemned. The American Society of Civil Engineers and the American Institute of Consulting Engineers, both member organizations of the Council, have adopted resolutions opposing these practices.

"Members of the engineering profession who respond to public invitations to submit bids for rendering engineering services," declared the Institute, "thereby lower their individual and professional standing and tend to bring indignity and discredit on an honorable profession."

The Institute held that the element of price is one of the least of the considerations involved. Personal integrity and strength of character, executive and administrative ability, extent and variety of professional experience and general standing in the profession and before the public were cited as controlling factors in the selection of engineers.

The American Society of Civil Engineers has taken a similar stand, its resolutions asserting that such procedure is not in the public interest, is contrary to recognized practice in engaging professional services and in effect asks of engineers a form of competition inconsistent with the practical ideals and ethics of the profession.

The Institute of Consulting Engineers urged its members to decline to give bonds for services or duties to municipalities, saying:

"The duties of an engineer retained by a municipality usually demand the exercise of professional judgment and discretion, and moreover such services are contingent for success, not alone on the skill, ability or judgment of the engineer, but usually also on the outcome of affairs which often depend largely on physical, financial and other conditions not within the control of the engineer, and the obligations imposed on an engineer by such an engagement are evidently not capable of definite or exact quantitative determination as to their fulfillment.

"To hold the engineer responsible for the results of such an outcome, is not only inequitable and unjust, but tends to bring about the unsatisfactory condition of limiting such engagements to engineers who are willing to disregard the inequitable liability and the unwarranted risks which they thereby are required to assume, in their desire to secure engagements."

The Civil Engineers said that to fortify with a performance bond contracts entered into by members of the engineering profession and municipalities is to lower the dignity and standing of the profession. The practice was characterized as out of harmony with the treatment of members of other professions. The members of the American Society of Civil Engineers were urged to make their propositions and agreements to render professional service in such form that wherever practicable bonding could be avoided in either municipal or private work.

The Editor Comments —

Smooth Riding—The Taxpayers' Test

It makes no difference how closely the number of lineal feet of pavement laid by a contractor coincides with the theoretical maximum footage, nor how remarkable a strength may be secured by holding down the water content, nor even what wonderful speed may be made by a well-tuned organization in pouring a concrete slab, if the finished product, when opened to traffic, rides like a Toonerville Trolley or even with a rhythmical thump at the expansion joint. The taxpayer has two yardsticks to measure the pavement that the Highway Department designs and the contractor builds. The first is smooth riding and the second is long life.

Long life is essential and it is here that careful design of mixture, careful following of specifications, clean aggregate, and proper curing are most important. The initial reaction of the taxpayer, however, is the riding quality of the road when it is opened to traffic and he no longer has to use the pestiferous detour. The longitudinal float irons out the bumps in concrete pavement.

In upwards of 40,000 miles of travel by automobile in 34 of the 48 states in the last 2 years, I have been very much impressed with the value of the longitudinal float as a means of producing the best riding surface for concrete roads. Pavements built within the last few years and finished with a longitudinal float have been smoother and in discussing this very subject D. W. Sawyer, Office Engineer, North Carolina State Highway Commission, writes, "By using this float, you are sure of a smooth surface and a good riding road, and every state in the Union should use it. For this reason everyone who visits our State compliments our good roads. If you are successful in getting one highway well floated, there would be no trouble in getting the engineer to use this method on all roads."

This letter was brought about by the enthusiasm of a contractor in a state where longitudinal floating is not required. He wished to produce a road which would be outstanding and in discussing the matter when visiting his job, I called his attention particularly to the value of the 10 or 12-foot longitudinal float in ironing out the bumps in the direction in which traffic uses the road. Consider a line drawn longitudinally on a concrete road representing the track of an automobile. The natural desire is to make this line as free from bumps as possible, but every operation which is performed on the road in finishing it is run transversely unless the longitudinal float is used. The first operation after the concrete is placed by the paver is to run a finishing machine over it, the screed of which works transversely; following this is the belting, possibly a hand screed but every operation is across the road, and it is reasonable to assume that in spite of carefully cleaned forms and the greatest care possible in the use of hand finishing methods, that the pavement will have many, though small, transverse ridges, which when the pavement is still wet and is tested with a straight-edge do not show up with any great degree.

If the final finishing operation is a longitudinal float, these transverse ridges are ironed out in lengths of 10 to 12 feet, and with the overlapping of the floating practically all chance of vibration within a rapidly moving motor car is eliminated and quieter and easier riding results. We urge such great road building states as New York and New Jersey to consider seriously the value of the longitudinal float as a valuable finishing tool in taking out the expansion joint bumps.

The next most universal cause of bumps in concrete is the improperly maintained expansion joint. No matter whether the premoulded type or the poured type of joint is used, it will be exuded when the pavement expands and unless the maintenance crew removes the excess, it is quickly mushroomed on the pavement by traffic and the familiar "tha, da, tha, da," is heard and felt in the automobile as it speeds along. A square shovel carefully pushed across the road along the joint, with plenty of beef behind it, can remove much of this trouble. In the case of premoulded joints which have more body some sharp tool or knife might well be used to remove the excess, much to the comfort of motor traffic.

The Straight-Edge in Bituminous Construction

It is a very hopeful sign for vastly improved bituminous road construction when one sees, in Pennsylvania and Massachusetts, as I have these last two years, asphalt macadam and sand-asphalt roads being checked constantly with a straight-edge during construction. The old idea that a "flexible road" is ideal is very good, but it must be built with a smooth riding surface on an adequate base if it is to maintain its popularity and fill its rightful place in the vast program of construction of main highways and farm-to-market roads. Asphalt engineers and contractors must make more general use of the straight-edge in every stage of construction.

Initial construction must be on a well-prepared foundation with a well-compacted stable base, on top of which is placed the surface course, also well-compacted and with the proper asphalt content. Rolling of the base course is solely for compaction but the rolling of the top course must include attention to eliminating waviness and inequalities which will be noticeable to traffic on the finished road. The constant use of the straight-edge during the laying and rolling of the top or surface course will bring the ideal closer in asphalt road construction.

Yours for smoother riding pavements,

Theodore Reed Kendall

Winter Grading

on

Virginia Mountain Job

Speeded Completion of Subgrade in Preparation for Bituminous Macadam Surface

NARROW roads on steep grades with sharp and frequent curves have been the rule on Virginia mountain roads until the present road construction program was started. The work now under way in the mountainous sections of the State calls for 32-foot grades with 18-foot bituminous macadam surfaces furnishing the rapidly increasing motor traffic with safer and more enjoyable riding surfaces.

Northwest of Blacksburg, Va., in the southwestern section of the State where is located the state college of agriculture and mechanics, Virginia Polytechnic Institute, a 4,104-mile grading project was recently completed on State Route 23 leading toward West Virginia. F. K. Rich & Co., Princeton, West Virginia, was the general contractor for the project but sublet the grading to Marye & Blankenship of Shawsville, Va.

Grading Started in October

Grading was started about 2,000 feet from the west end of the project on October 8, 1929, with a Northwest 1-yard gas shovel. This equipment operated all winter with temperatures as low as 3 degrees below zero and considerable snow, but no trouble was experienced other than starting in the coldest weather which was overcome with the use of a little ether in the gas.

The grading called for moving a total of 68,400 yards of material under the heading of "unclassified excavation" at 49 cents a yard. Of the total yardage, 5,000 yards was rock and the remainder earth which made the bid a very equitable one. At one section close to the west end of the work which was the highest point on the project a ledge of manganese ore was struck which defied the best efforts of the drillers. The drills seemed to make almost no impression on the tough rock before they were dulled. By the use of extra heavy charges of dynamite in shallow holes the 600 yards of rock was finally removed.

All Excavation Hauled

The nature of the terrain was such that it was not possible to cast the excavated material so every bit was hauled by the contractor's trucks and 2-up dump wagons. Only three trucks were used as the going was so bad most of the time that they proved unwieldy. They did, however, work to great advantage as soon as the fills were up sufficiently to permit leveling them for maintenance of a roadway. There were two Indiana trucks and one International truck and six Watson dump wagons.

Toward the latter part of the grading which ended May 23, the subcontractor rented a second shovel, a Marion ¾-yard steam shovel from the general contractor to help out at the easterly end in earth.

The fills ran as high as 38 feet, and in most instances were side hill fills which rendered the work of compacting the fills with 10-ton rollers difficult and costly, due to the difficulty of getting the rollers down to the fills. It was required that the material for the road bed be deposited in 1-foot layers and it was often necessary to hook Caterpillar tractors to the trucks to pull them from the bottom of the fill back to the shovel. As soon as the fills reached a height where it was possible to get a roller down to them the work of rolling was begun. The fills stood up remarkably well, however, due to the constant use of them by contractor's wagons and cross-mountain traffic. The cuts ran up to 42 feet and as low as 1 foot. The average haul for the whole job was not higher than 350 feet but on one of the deepest fills was about 700 feet.

MAINTENANCE OF TRAFFIC

As this road was an old earth road across the mountain and the only means of access to a large section of blue grass country to the north and west it was necessary to keep the roadway open to traffic at all times. The contractor was not required to do any special maintenance of the surface but with the exception of short periods immediately following blasts the road was in shape so that motor traffic could maintain a speed of 20 miles an hour over most of the work. This was helpful to the contractor's own trucks and also kept public traffic moving.

A Caterpillar Thirty with an Adams No. 7 grader was used to keep the road in shape and to grade off the fills. Most of the work on smoothing the fills after the dumping of the wagons was done by hand labor. The total labor organization during the winter, including the shovel operator and foremen, was about 25, which was increased in the spring to about 50 men, average. A camp was maintained at the east end of the job near Blacksburg for the colored labor, and the white employees boarded in Blacksburg.

DRILLING AND BLASTING

Portable air compressors were used at the sections where rock drilling was necessary. Two Ingersoll-Rand portable compressors were used with an I-R jackhammer on one and a Hardsocg drill on the other. Except on the one bad section mentioned the drilling went very rapidly and with little trouble. Most of the holes were from 6 to 8 feet deep with the maximum necessary about 18 feet. Regular drill steel was used sharpened at a blacksmith shop at the colored labor camp.

Over 2 tons of Hercules 40 per cent gelatine dynamite and 1½ tons of black blasting powder were used. The black powder was used to loosen the shale in front of the shovel when digging became too hard and most of it was used during the last few weeks of the work on side ditches where the original shots did not cut deep enough to give the required cross-section.

"GRIEF"

All in the rough grading went off in fine shape with a minimum of trouble but one interesting bit of trouble did appear in an unusual place. At the extreme westerly end of the job while the Northwest shovel was excavating rock it was mired in a spot not much bigger than the shovel itself. A spring running out of the rock softened the earth immediately adjacent to the rock to such an extent that the shovel was helpless. The aid of the Caterpillar Thirty for a few minutes put the shovel back into service but not until the contractor had marvelled at the unusual event of a shovel miring while working on a rock ledge.

LAYING 8-INCH BASE COURSE FOR BITUMINOUS TOP

The general contractor, F. K. Rich & Co., laid the 8-inch base course over the subgrade prepared under the subcontract. Stone was hauled from the Blacksburg railroad station with 4.5 miles dead haul. Stone was received at the unloading trestle adjacent to the railroad terminal in hopper bottom cars and dumped through receiving hoppers controlled by gates to the trucks below. From four to eight cars of No. 1 stone and one to two cars of dust for filler were unloaded daily by the 3 men stationed at the unloading trestle. A total of 20 trucks varying from 1 to 4-ton capacities, including Ford, Indiana and International trucks, were used for hauling the stone. All trucks were hired, some being paid by the hour and others by the load. The stone was spread from the tailboard of the truck as evenly as possible and then distributed by 4 men.

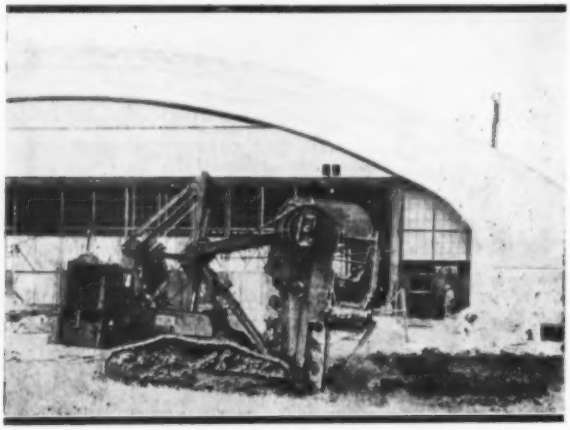
The 8-inch base course of No. 1 stone was compacted by two 10-ton rollers, one Buffalo-Springfield and one Galion Master roller. Work on surfacing was started May 1, 1930, and completed July 1.

PERSONNEL

The work was in charge of F. K. Rich for the general contractor, F. K. Rich & Co., Princeton, W. Va., and C. E. Blankenship was in charge for the subcontractor, Marye & Blankenship, Shawsville, Va. The Resident Engineer for the Virginia Department of Highways was J. L. Sneed with H. L. Hanger as Inspector.

HARD GOING AND EASY GOING ON A VIRGINIA MOUNTAIN JOB

1. A Northwest shovel owned by Marye & Blankenship moving around a shallow rock cut. 2. The Marion steam shovel of F. K. Rich & Co., loading a dump wagon on earth excavation



Digging a Trench for Drainage Tile in Front of the Apron of One of the Hangars

How Sky Harbor Was Drained

SKY HARBOR, the scene of the famous endurance flight of John and Kenneth Hunter, was not always as accessible for airplanes as it was during June and the early part of July. There was no dry, firm runway; instead, there was a hopeless mass of pools and greasy clinging muck, the usual condition of this particular land in wet weather.

Water had to be carried off to an open natural water course nearby. To do this it was necessary to lay 68,250 feet or approximately 13 miles of tile. Using a Barber-Greene vertical boom ditcher, William Sundvall, ditching contractor of Des Plaines, Ill., did the job.

A total of 900 lineal feet of 20-inch tile formed the mains and tributary to them were laid 1,750 feet of 15-inch tile, 2,600 feet of 10-inch tile, 4,000 feet of 8-inch tile and 5,540 feet of 6-inch tile. This much of the drainage system was laid in November and December of 1928 under very wet weather conditions.

From May 25 to June 26, 1929, a total of 53,460 feet of 4-inch and 6-inch tile was laid at the average rate of 1,782 feet per day, exclusive of such ditching jobs as cutting water and cable lines and digging manholes. The maximum depth of the trench on the field was 8 feet, the minimum 2½ feet and the mean depth approximately 3¼ feet.

The crew required to perform this tiling job consisted of the ditcher operator and two tile layers. The trench for the tile was kept accurately to grade by means of a system of targets. Two targets were set along the line of the trench and then a third target was placed on the digging boom of the ditcher. By sighting on these three, the operator was able to keep his trench depth correct at all times. The fact that this make of ditcher is equipped with a power hoist for raising the boom while it is digging and that the digging boom is vertical made it possible for the operator to keep the depth of his cut under control all the time without leaving his seat. The vertical boom feature also facilitated the cutting of manholes with the ditcher.

When the trench had been dug, one tiler drove a team of horses along it, unloading tile, and another man put the tile into the trench. It was not found necessary to do any hand grading except where making connections. Streator tile of hard burnt shale was used.

After the tile had been laid, limestone was used as a porous fill in the trench. This stone, about the size of pea gravel, was loaded in trucks and dumped directly into the trench, being levelled off by hand. The trench was completely filled with stone, except in the case of the deepest cut.

In spite of a great deal of water, digging conditions were fairly good. The land was somewhat swampy along the main tile line, but otherwise the soil was clay with a few small boulders which offered no obstacle to the ditcher.

Truck Figures from Road Contractors

IN an endeavor to secure data on the operation of motor trucks all over the country, the General Motors Truck Co., Pontiac, Mich., has recently completed a survey tabulated from questionnaires received from nearly 6,000 truck users in the United States, owning and operating over 46,000 trucks. Answers were received from all states, from large and small cities and towns, from firms in all lines of business and from owners of great fleets down to owners of only one or two trucks.

From road contractors, 83 replies were received covering a total of 2,101 trucks. Of this number 490 were light duty trucks, ranging from ½ to 1½ tons capacities; 946 were medium duty trucks from 1½ to 3 tons, and 665 were heavy duty trucks of over 3½ tons.

Thirty-two of the firms reported that they use special bodies made and adapted to their special requirements by body makers, 37 use standard bodies and 7 firms use both types. The remaining 7 did not reply to this question.

Seventy-one of the 83 contractors pay their drivers a straight salary, 7 pay a salary and bonus and 3 firms pay a straight commission.

For light duty trucks 11.9 miles per gallon of gas and 106.0 miles per quart of oil was the average; for medium duty trucks 7.8 miles was reported as the average per gallon of gas and 86.6 miles per quart of oil, while the heavy duty trucks made only 5.8 miles per gallon of gas and 79.9 miles per quart of oil.

The average payload was reported as 5,311 pounds for light trucks, 7,068 pounds for medium duty trucks and 10,955 pounds for heavy duty trucks. The light trucks averaged 9.4 miles for each haul or route, medium trucks 17.5 miles and heavy duty trucks 11.2 miles. The average number of stops for each type were 34.3, 38.2 and 32.4 per day, respectively.

Operating costs, including maintenance and depreciation, averaged 9.6 cents per mile for the light trucks, 16.3 cents for medium trucks and 18 cents for heavy duty trucks.

Thirty-six, or 58 per cent of the road contractors, reported that they did all their own hauling and delivery work with their own trucks, while 27 said that they hired trucks for part of the work. Of those who hire some of the trucking done, 5 used the hired trucks for cartage to and from a railroad, 19 for heavy delivery, 9 for long distance hauling and 12 for light delivery work.

Hauling Dirt from the Shovel to the Fill on a Real Estate Development Near Cleveland, a 6-Yard Euclid Crawler Wagon Is Shown Being Drawn by a Model 30 Cletrac

This company has steadfastly refrained from implications and claims which, while literally true, might mislead the readers of its advertising. This series of advertisements will set forth some facts which, we hope, will assist our readers to positive assurance concerning the most satisfactory solutions of their pumping problems.

THE LABOUR CO., INC.
H. E. LaBour

No Capacity Wasted by Recirculation in LABOUR PUMPS

THE principles and physical laws which govern the operation of centrifugal pumps make it impossible for them to pump air alone. Centrifugal force is a matter of *throw*, and air alone cannot be thrown effectively in a water pump.

In order to establish prime, it is, of course, necessary to remove the air from the suction line. This can be accomplished by a separate air pump or by a centrifugal pump which will entrain the air—mix it, so to speak, with the water, throw the water out, remove the air from the water and bring the water back to pick up more air. That is exactly what happens in the LaBour Self-Priming Centrifugal Pump.

The difficulty is that after prime has been established and there is no more air to be removed, it is no longer necessary for water to come back and go through the pump again and again. In some pumps the return of water after prime has been established is prevented by means of valves. In other pumps, whose manufacturers wish to avoid the complications and uncertain operation of valves, a certain portion of the water is permitted to recirculate at all times. In these pumps recirculation increases rather than decreases after the pump is primed, because there is an increase in the pressure difference between the suction and discharge connections of the pump.

As was explained in the advertisement preceding this one, the LaBour Pump is the only self-priming centrifugal pump which has *no valves and does not recirculate* a single drop of water after the air has been removed.

The only way to eliminate valve trouble is by eliminating the valves themselves. It is equally important that the fullest capacity of the pump be utilized in moving water from one place to another, an accomplishment which is impossible where recirculation is permitted. Furthermore, the small by-pass opening used in recirculating pumps frequently clogs with sand or dirt which piles up because water is always moving in the same direction.

By means of the patented LaBour construction, there is no necessity for a valve and yet recirculation cannot take place after prime has been established. Not only this, but the water flows in the opposite direction through the secondary opening, a fact which eliminates the possibility of clogging. No other valveless pump can truthfully be said to have no recirculation, and no other centrifugal pump which does not recirculate can prime itself unless it has one or more valves.

Investigate all of the LaBour features. Compare and study the means and methods whereby the unusual results are accomplished. Full information concerning the LaBour line supplied at your request.

This is the third of a series of advertisements which we shall endeavor to make a veritable primer of pumping. Reprints may be had for the asking.

THE LABOUR CO., INC.
ELKHART, INDIANA

LA BOUR PUMPS

NEVER LAY DOWN ON THE JOB

How the Other Fellow Did It

Construction Briefs

How Do You Bring Up Forms?

48. The character of the territory through which a road is being paved, determines in large measure the equipment used by a contractor for bringing up forms. One contractor in Tennessee had to use two men to a form to bring them up as there was not space on the shoulders for a horse to pull any kind of a vehicle because the ground sloped off abruptly to a river on one side and a ledge on the other. Many contractors keep a utility truck available for this type of work, where a detour may be used, or there is sufficient space on the shoulder for the truck, or where the pavement is laid in strips.

An Ontario contractor used a stone sled back of the concreting operations to bring up the forms as they were pulled and also to move the pipe from the water line when it was no longer needed. 19.3.76

Novel Way of Handling Cement on Road Job

49. On a Canadian concrete pavement project, a contractor faced the problem of building a large cement storage shed or else facing demurrage charges on the cement cars at his central mixing plant. The problem was solved by laying an industrial railway track alongside the spur track and unloading the cement in bags onto a flat car and pushing it to the elevator at the mixer. The seven bags in the batch were emptied into the elevator and then at a signal from the mixer operator the elevator was raised about 15 feet and automatically dumped into a small metal hopper from which the cement flowed by gravity to the top of the stone batch in the calibrated hopper of the mixer. 19.2.55

A Y and Two Valves on the Paver

50. On a Long Island, N. Y., paving operation, the mixers were fitted with a Y and two valves for the hose connection so that the mixer was never without a water connection. As one hose was about reaching its limit the next length was attached to the second branch of the Y from the next tap of the pipe line and the old one shut off only when the new connection was completed and opened. Thus the mixer was never in a position where it could not get water for a batch instantly.

Another detail that is particularly interesting and has demonstrated its usefulness was the equipping of the mixer hose with a branch connection about 50 feet from the Y. At this branch an ordinary garden hose was connected for wetting down the subgrade, thus eliminating the need for a second hose running along the subgrade ahead of the paver. 19.1.57

Industrial Side Dump Cars Supplement Trucks at Crusher

51. On a 7.83-mile 18-foot bituminous macadam job in northeastern New York, the contractor operated his own quarry. He found that two trucks working from the quarry face to the pit above the crusher were not quite sufficient to keep the plant fully supplied at all times. To supplement the trucks two industrial side dump cars salvaged from another job were rigged with cables and used on the tracks which were moved as desired along the side of the pit, the cars being hauled up the opposite side of the bin from where the trucks dumped. 19.2.62

Well Point Drainage for Excavation Close to Stream

52. Well point drainage was used in an interesting manner in a district which had a great deal of clay inlaid with sand. This combination made it possible to eliminate all sheeting. The well points were placed about 32 inches apart, this being necessary because the clay held the water so tenaciously that a wider spacing would not have removed the water sufficiently to eliminate the use of all sheeting along the sides of the excavation. In only one or two short stretches where the clay seemed more solid, not allowing the water to seep through as in most parts of the work, was any sheeting put up, and this was only light boards as a precaution. The well points were on 1½-inch casing tapped to a 4-inch header. There was a maximum of 70 points working when the excavation was the deepest. Two diaphragm pumps were used to unwater the system part of the time, but only one was needed after the bottoms of the tanks were sealed with concrete. 19.2.90

Safety and Cooperation

53. On a large asphalt paving job equipped with a well-planned plant set-up, in Ontario, the platforms around the stone bins and the screens were completely equipped with hand rails and stairs instead of the all-too-frequent, crudely made ladders. This is an important contribution to the morale of the men who are thus unconsciously able to give more of their thought to the operation of the plant and less to their immediate safety.

Throughout the entire organization on this particular job, there was a spirit of cooperation everywhere from the laborers on the road to the superintendent. The plant and road crews worked throughout daylight which was from 4 in the morning to as late as 9:30 at night. The Italian hot-mix crew on the road was noted for its singing which could be heard for a quarter of a mile as they returned at night from work after putting in the entire day on the road. Foremen and truckmen all had the complete confidence of the superintendent and were able to use their own initiative to a remarkable degree to see that their part of the work progressed satisfactorily.

It was this remarkable morale that minimized the shut-downs on the road and made possible such production as 1,200 tons of gravel from the pit per day, 300 yards of fill, 50 tons of hot mix per hour from the plant and a mile a week of hot mix pavement laid with a comparatively small organization. 19.3.54

Keeping the Earth Cover Damp

54. There are still a great many states which insist upon earth cover for curing concrete roads. The use of this method has probably done more to accelerate the use of admixtures and bituminous compounds to be applied to the surface of the slab because of the arguments which arise between inspector and contractor as to whether the earth cover is really damp or sufficiently wet to aid in the curing of the concrete.

On one job in the Province of Quebec, where a central mixing plant was used, thus doing away with the need of a water supply line along the shoulder, the sprinkling of the earth cover was handled by a tank truck with a power take-off operating a small centrifugal pump. The centrifugal not only pumped the water into the tank truck from a small stream, but also pumped it out through a nozzle made up of a pipe hammered down to a slot and with a swivel to permit directing it satisfactorily. 19.2.56

FOUR BIG Ransome MIXERS for SAFE HARBOR DAM

WHEN the Arundel Corporation of Baltimore needed mixers for the big dam across the Susquehanna at Safe Harbor, Pa., they selected four No. 56-S Ransome Standard Building Mixers for the job.

A *big* engineering undertaking — calling for *big* mixers! The dam will be approximately one mile long and 65 feet high.

When *you* buy Ransome Big Mixers for *your* big jobs, you have the certainty of maximum output combined with minimum delays. Remember the mixer is the heart of the job when concrete is being placed. The simpler and sturdier it is, the greater your insurance against mixer delays.

Ransome Big Mixers are outstanding in simplicity and sturdiness. Write for Bulletin 122.

Ransome Concrete Machinery Company

1850 — Service for 80 Years — 1930

Dunellen New Jersey

Who's Who in Construction

A Series of Reports from Active Contractors

BUS. VOLUME—ANNUAL VOLUME OF CONTRACTS

A—Over $5,000,000
B—Between $1,000,000 and $5,000,000
C—Between $500,000 and $1,000,000
D—Between $250,000 and $500,000
E—Under $250,000

R. G. Le Tourneau

R. G. Le Tourneau Co., Stockton, Calif., 122 Moss Ave. Organized: 1920. Bus. vol. C. R. G. Le Tourneau builds all his own equipment for his contracting and uses Caterpillar Sixties to operate them. At present he has gone into the manufacture of this equipment for sale and has made some shipments to foreign countries. Officers: R. G. Le Tourneau, General Manager; Ray O. Peterson, General Superintendent: Howard Peterson, Superintendent of Construction. Major contracts: 1928, railroad yard for Southern Pacific R. R. Co., Fresno, Calif., about $90,000; a canal levee near Patterson, Calif., for E. T. Fisher of Phoenix, Ariz., about $100,000; 1929, highway for State of California at Newhall, about $450,000; 1929-30, new roadbed for the Southern Pacific R. R. Co., at Benicia, Calif., about $200,000. Member: Associated General Contractors of America.

J. A. Ross & Co., Chicago, Ill. 2015 N. Kolmar Ave. Organized: 1895. Bus. vol. C. This company was incorporated in 1912. Officers: J. A. Ross, President; Edward A. Ross, Secretary and Treasurer. Major contracts: 1927, paving, Bryn Mawr Ave.; 1928, paving, Kedzie and Jersey Aves.; 1929, paving, Hortense Ave. system and Kimball Ave., all in Chicago. Member: Chicago Association of Commerce.

Two States Construction Co., Junction City, Ark.-La., P. O. Box 67. The Two States Construction Co., is a subsidiary organization of the Crooked Pine Plantations and operates only during the summer. Its main purpose is to keep the plantation labor busy during the off season to keep the organization intact. It takes care of the drainage, construction of roads and building on the plantation and some few small jobs in the vicinity of Junction City. Officers: Alfred T. Brown, owner.

F. F. Wier Construction Co., Moline, Ill., 506 15th St. Branch office: Woodstock, Ill. Organized: May 28, 1927. Bus. vol. D. From 1920 to 1925 F. F. Wier organized and managed the Western Construction Co., and in 1925 Mr. Wier and A. G. Fletcher organized and incorporated the Central Illinois Engineering Co. In 1927 Mr. Wier incorporated his own company in Illinois. The work consists mainly of grading and paving of city streets and other grading work. Officers: F. F. Wier, President; James M. Johnston, Vice-President; P. L. Keagle, Secretary and Treasurer. Major contracts: 1927, grading and paving for Farmington, Belvidere and Morrison, Ill.; 1928, grading and paving for Farmington and Rock Island, Ill.; 1929, grading and paving for Winchester, Marengo and Washburn, Ill.

New Mexico Construction Co., Inc., Albuquerque, N. M., K. of P. Bldg. Branch offices: Denver, Greeley and Colorado Springs, Colo. Organized: 1920. Bus. vol. B. Officers: A. R. Hebenstreit, President; Vincent K. Jones and J. B. Wadlington, Vice Presidents; N. M. Switzer, Secretary and Treasurer. Major contracts: highway construction in New Mexico, Colorado, California and Arizona; airports for T. A. T. and Western Air Express at nine locations in seven states; paving at Albuquerque, Clovis, Roswell, Tucumcari, New Mexico and Denver, Colorado Springs, Greeley, Trinidad, Pueblo and Grand Junction, Colorado; Evergreen Dam, Denver, Colo. Member: Associated General Contractors of America.

Ralph E. Bull, Fitchburg, Mass., 151 Harrison Ave. Bus. vol. E. Officers: Ralph E. Bull, owner. Major contracts: road construction, Dublin, N. H., $80,000; Peterboro, N. H., $85,000; Plymouth, N. H., $38,000; Center Harbor, N. H., $60,000; Marlboro, N. H., $130,000; Erving, Mass., $230,000.

F. B. Styles Contracting Corp., Chicago, Ill., 35 North Dearborn St. Branch office: 14 Brinkerhoff St., Jersey City, N. J. Organized: 1920. Bus. vol. E. This company was incorporated in Illinois in 1921. Officers: F. B. Styles, President; J. Styles, Vice-President; C. E. Brooke, Secretary. Major contracts: railroad bridge construction in Illinois, Indiana and Mississippi for Illinois Central Railroad, Monon Railroad, Chicago & Eastern Illinois Railroad and Chicago, Milwaukee, St. Paul & Pacific Railroad. Member: Associated General Contractors.

Northwestern Construction Co., Craig, Colo. Organized: August 20, 1920. Bus. vol. E. The original partnership was organized in August, 1920, for the purpose of engaging in highway and bridge construction work, the organizers being John W. C. Rogers, Roy G. Weyand and Joseph Biskup. On March 25, 1929, Joseph Biskup, C. E., bought up the interest of his partners and took into the business with him his two sons, Stephen J. Biskup and Joseph Biskup, Jr., who now make up the organization. Officers: Joseph Biskup, Senior Engineer and General Manager. Major contracts: 1927, 5 miles of forest road work, Derby Mesa Road, near Burns, Colo., $15,000; 1927-28, 175-foot steel deck bridge with approaches, $50,000; 1930, furnishing gravel for contract west of Craig, Colo., $22,000.

F. B. Ryan

F. B. Ryan, Chariton, Iowa, 521 No. 5th St. Organized: January 1, 1929. Bus. vol. E. From 1912 to 1922 F. B. Ryan was in partnership with T. Ryan & Sons in Missouri Valley, Iowa. From 1922 to 1929 he was in partnership with R. J. Ryan under the name Ryan Bros., also located in Missouri Valley. Officers: F. B. Ryan, owner. Major contracts: 1927, grading and drainage work, Lucas County, $35,000; Monroe County, $16,000; Lucas County, $30,000; 1928, Marion and Warren Counties, $90,000; 1929, Warren County, $15,000; Keokuk County, $30,000, all in Iowa. Member: Central Branch and National Associated General Contractors.

A Step on the Pedal Makes It Hum

And NOW "LAUSON Quality" for You—

in a remarkable new ½ to ¾ HP. Gas Engine

The Perfect Substitute for the ½-hp. Electric Motor for running—

Centrifugal Pumps, Air Compressors, Force Pumps, Electric Generators, Etc.

Before equipping such machinery with gas engines or purchasing machines so furnished, investigate this exceptional Type "RA" Lauson.

Proven Design—No Untried Features

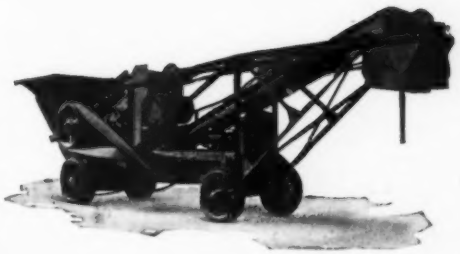
Everything in it has been adapted from other types of Lauson Engines and represents tried and proven merit. A surprising array of superior features not found in motors of this type.

Write for special, fully detailed descriptive and illustrated bulletin

The LAUSON CORPORATION 11 Jackson St, New Holstein, Wis.
FORMERLY THE JOHN LAUSON MFG. CO.

Good Roads MACHINERY

CRUSHERMOBILE



SCREENING, CRUSHING AND LOADING PLANT

COMPLETE on one mounting — Self transporting under its own power —Nothing to detach when ready to move—Follows shovel or feeder into bank or pit.

Producing ¾" to 1¼" material at a nominal capacity of 300 to 350 cubic yards per day.

EQUIPPED WITH CHAMPION ROLLER BEARING REDUCTION CRUSHER

THE GOOD ROADS MACHINERY CO., Inc.

KENNETT SQUARE, PA.

Branches:
PHILADELPHIA
NEW YORK
WATERTOWN, MASS.

HARRISBURG, PA.
PITTSBURGH
CHICAGO
FRANKFORT, KY.

Legal Points for Contractors

These brief abstracts of court decisions in the contracting field may aid you in avoiding legal difficulties. Local ordinances or state laws may alter the conditions in your community. If in doubt consult your own attorney

Edited by A. L. H. Street, Attorney-at-Law

Use of Non-Union Labor Did Not Justify General Contractor in Repudiating a Subcontract

"We can't let you go ahead with that subcontract to install tile, marble and bath room fixtures on the apartment house job, unless you use union labor," said general contractors to the subcontractor.

"But it was orally understood when the subcontract was made that we would use non-union labor, and that is why we struck out a clause that would have required use of union workmen," replied the subcontractor.

"Yes," said the g. cs., "but we did not count on what is happening now. The unions will call a strike on the job, if we let you go ahead with non-union men."

So the general contractors refused to permit the subcontractor to proceed, and relet the tile, etc., work to a union subcontractor. And the first subcontractor sued for damages.

In the case of Moore v. Whitty, 149 Atl. 93, decided January 6, 1930, the Pennsylvania Supreme Court decided that the first subcontractor was entitled to damages on the ground that the general contractors had no good excuse for terminating the subcontract. Said the court, in part:

"The general rule is that mere inconvenience, though it works a hardship on a party, does not excuse him from the performance of an absolute and unqualified undertaking to do a thing which is both lawful and possible, . . . and, where performance becomes difficult or impossible by reason of something occurring subsequent to the contract, the promisor is not thereby discharged if it appears that the thing to be done is lawful and possible in itself, inasmuch as it is his duty, if he wishes to be excused from performance in event of such contingency arising, to provide for that situation in his contract. Contingencies not provided against will not ordinarily excuse performance. . . .

"Defendants were fully informed of all the circumstances and agreed to omit the clause requiring the employment of union workmen. Having failed to provide against the very contingency which both parties were aware might occur, the happening of such contingency cannot be set up as an excuse for failure to perform. Furthermore, there is no such impossibility of performance as is required within the rules governing such defense. There was no evidence to show inability to complete the work without the aid of union men, or even to show that it would have been impossible to complete it with union labor working with non-union employees."

Responsibility for Dynamite Cap Accident

As is well-known, a boy plus a dynamite cap equals trouble. Therefore, the law imposes upon contractors the duty to use the highest care to guard against exposure of such explosive material. But, as noted by the Texas Court of Civil Appeals in the case of Jagoe Construction Co. v. Harrison, 17 S. W. 2d, 861, disposed of May 30, 1929, one claiming damages on account of injury resulting from a boy having come into possession of a cap must prove that he got it through fault of the contractor; fault is not to be presumed.

Countermanding Checks

The risk of bank failure is not the only reason for prompt cashing of checks. Even in the case of a check drawn on a bank as "strong as Gibraltar," there are chances that it will be dishonored. In case the maker is not perfectly sound financially, there is not only the risk of an overdrawn account, but possibilities of intervening garnishment, etc.

But the particular risk to be pointed out in this article is the possibility that the maker may stop payment on the check. An owner, having given a check in final settlement for a construction job may imagine that he has found something wrong with the job, and notify the bank to stop payment on the check. Fortunate is the contractor if the check has already been paid, for it means that if there is any lawsuit it will have to be brought by the owner.

A person obtaining something of value on the strength of a check might be held criminally responsible, on a theory of false pretenses, in stopping payment. But, as a general rule, stopping payment on a check, whether for good reason or none, can do no more than render the maker liable to the holder of the check for its face amount, plus interest.

All ordinary checks are subject to countermand, but most courts hold that a certified check or a cashier's check is not. Notice to stop payment may be given orally, by telephone, telegram or letter, as well as by formal notice.

Notice comes too late when the bank has already received the check and credited the amount to the holder.

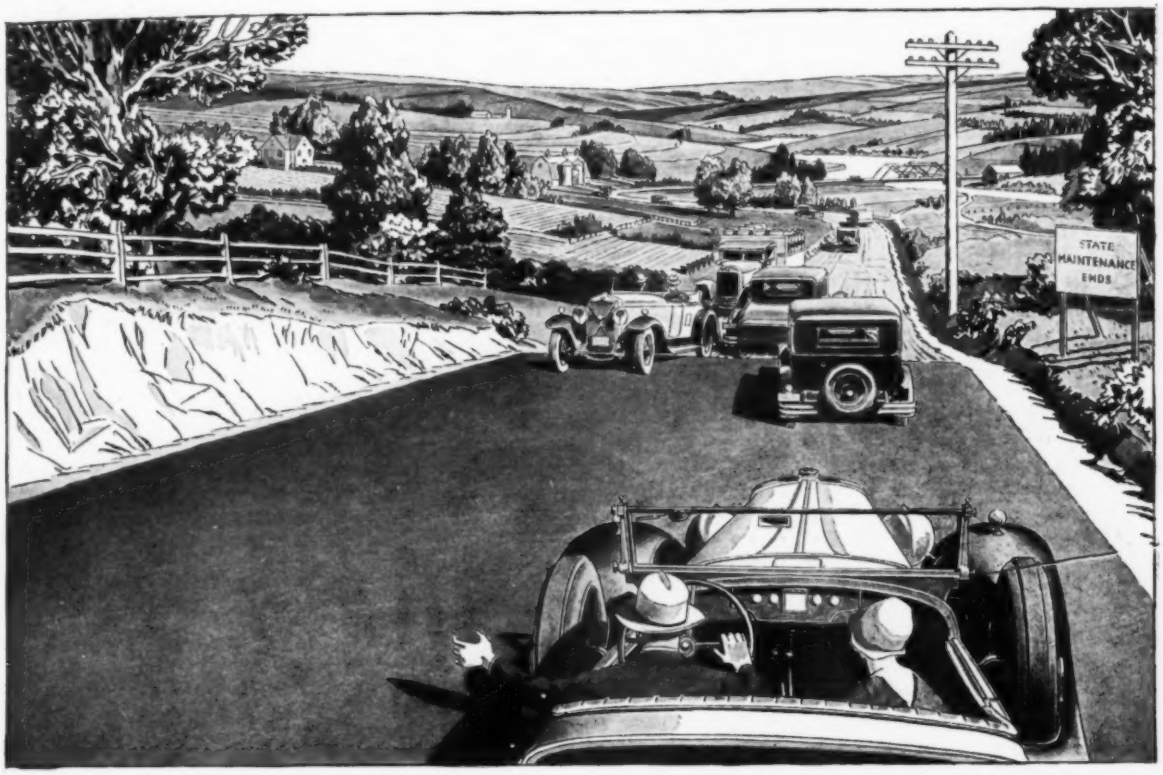
Authority of Construction Foremen

If a contractor were to desire to stop payment on a check, he would not be apt to notify his bank's janitor to that effect, although the janitor might be the first person met on rushing to the bank. Why not? Answer is because it is not within the jurisdiction of a bank janitor to attend to such matters.

The point is a very important one in business dealings, and especially in dealing with corporations. Since a corporation has no ears itself, notice must be communicated to some one actually or apparently empowered to act for the company.

In the case of Crabb v. Uvalde Paving Co., 23 S. W. 2d, 300, decided by the Texas Supreme Court January 22, 1930, it was decided that notice to a foreman in charge of street paving that a certain abutting property owner was protesting the validity of the improvement proceedings was notice to the company.

More Road for the same money



MORE road for the same money! That means—not more road appropriations, but more appropriate roads!

The community that paves a moderately traveled route with an expensive pavement designed for heavy traffic, builds extravagantly for the future and uneconomically for the present. It is neglecting the immediate and continuing economy of good roads at low cost.

Tarvia economies extend to every branch of road building and maintenance. Tarvia construction provides time-proved methods and materials for every type of highway work. Tarvia provides smooth, easy-riding, skid-safe, durable roads that are modern in every essential. Tarvia enables any community to have more road for the same money.

The Tarvia engineer or field man will give you the details. 'Phone, wire or write our nearest office.

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New York	Chicago	Philadelphia
St. Louis	Minneapolis	Boston
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Tarvia
GOOD ROADS AT LOW COST

Paying Another Person's Bill

"Mr. Contractor, you owe us $1,913.33, because we paid out that much for the premium on the bond you gave us to secure faithful performance of the high school building contract," said a Maine city.

"But I did not authorize you to pay it for my account," replied Mr. C. "I suppose the next thing you will be doing will be paying my grocery and laundry bills and then coming around and asking me to reimburse you. I pay my own bills direct."

And the next day the city sued the contractor. A jury brought in a verdict for the city and the contractor appealed. The Main Supreme Judicial Court held that the contractor was bound to reimburse the city. (Inhabitants of Biddeford v. Benoit, 147 Atl. 151, decided July 15, 1929.

The opinion in this case will probably be regarded by judges and lawyers as an extremely important one, qualifying the general rule that one person has no right to pay a third person's debt and then demand reimbursement.

In the first place, the court said that where a contractor is required to give a bond he is bound to pay the premium unless there is an agreement to the contrary.

On the question of the city's right to reimbursement, the court said that, even if the city paid the premium voluntarily and without expectation of reimbursement, the fact that the payment operated to the benefit of the contractor was enough to entitle the city to demand reimbursement. But the opinion intimates that the decision might have been different had the owner been an individual, instead of a public corporation. And there is nothing in the decision that supports the right of a person to reimbursement on paying another person's debt officiously.

Contractor's Guaranty Did Not Cover Materials Chosen by Owner Nor Unusual Use

A Baltimore alley paving contract provided that the work should be guaranteed and kept in repair by the contractor for five years from the date of its acceptance. On a claim against the contractor under this clause, it appeared that disintegration of some of the paving might be due to the discharging upon it by abutting property owners of water containing alkali, etc. In this view of the case, the Maryland Court of Appeals in an opinion handed down June 24, 1929, (Reinhardt Construction Co. vs. Mayor and City Council of Baltimore, 146 Atl. 577) said:

"Generally, when a contract prescribes materials chosen entirely by the owner or engineer, and the contractor has no choice in respect to them, the contract cannot be construed to impose on the contractor an undertaking that the materials chosen will meet the demands to be made upon them. . . . Even a general guaranty of good condition during a period subsequent to completion has been construed not to include liability for mistake or miscalculation in an architect's plans. . . .

"Our opinion is that this clause does not impose upon the contractor a guaranty of the suitableness of concrete for the liquids flowing into the alleys, and that, if the contractor and surety should be able to establish as a fact that perfect concrete of the mixture specified, perfectly laid as specified, would not withstand the liquids poured over it in this instance, then there would be no liability under the guaranty clause for the cost of repairs to erosion from that source. The guaranty is broadly worded, and is presumably intended to avoid controversies on defects during the period, but, when we consider that the wording was prepared by the city, and that the fair and proper construction is that which a contractor might be supposed to place upon it reasonably, we come to the conclusion that it must be construed to cover only the results of insufficiency in materials and workmanship to stand the wear which concrete as specified can stand."

Employees Who Are Not Employees

A contractor may become, temporarily, the employer of workmen in the general employment of another, and thereby become liable, for the time being, for injuries to the borrowed workmen or for injuries negligently inflicted by them upon others, the same as if they were regular employees. On the other hand, the circumstances may be such that the workmen are to be regarded as the employees of an independent contractor, in which case there is no liability.

In the case of McHugh v. McCormick, 238 N. Y. Supp. 206, decided by the Appellate Division of the New York Supreme Court December 23, 1929, a lessee of a steam shovel was determined not to be the employer of men furnished by the lessor for operation of the shovel. The court said:

"There is no dispute . . . that the lessee of the machine had no control over it or the men who operated it, but that the only part with which the lessee had to do was to indicate when and where the work was to progress."

Owner of Timber Pile Not Liable for Fatal Injury to Trespassing Child

An eight-year old girl was playing around a pile of bridge timber 5 or 6 feet high when some of them fell upon her, fatally injuring her. An attorney attempted to recover damages on behalf of the child's parents on the theory that defendant, owner of the lumber pile, was negligent in maintaining a condition that was attractive but dangerous to children. But, in an opinion announced by the Oregon Supreme Court November 5, 1929, the court said, in dismissing the damage claim (Slattery v. Drake, 281 Pac. 846):

"The defendant in the instant case is certainly entitled to carry on a legitimate business enterprise. Would the law go to the absurdity of requiring him to build a high wall around this lumber platform in order to prevent children from being attracted or lured by these 'bright, new bridge timbers'? If so, what would be the color and height of the wall—for who knows what may be attractive or alluring to the active mind of a child? In the case at bar it is alleged that the child played daily upon this dangerous pile of bridge timbers for a period of three months, and that such place was in plain view of her home, 90 feet distant. If such be true, the parents must indeed have been derelict in their duty. Yet they now seek to profit by the fruits of their own negligence."

Attorney's Responsibility to Client

Just as a contractor is liable to an owner for damages resulting to the latter through carelessness or lack of skill, so the contractor's attorney is liable to him for losses resulting from negligence or inexcusable ignorance of law.

Since even the highest courts do not always agree upon what is the law of a given case, you must not expect your lawyer to be infallible in his opinions. On the other hand, you are entitled to expect more knowledge than was said to have been possessed by an attorney whose associates called him Necessity Smith—because "necessity knows no law."

The following points are well established rules of law:

An attorney must know and follow the statutes and settled rules of law of the locality in which he lives, and is liable to his clients for loss resulting from ignorance of those rules or failure to follow them. But he is not responsible for an error of judgment on a point as to which reasonable doubt might be expressed by well-informed lawyers, especially when the question has not been settled by statute or decision of the highest court of the state.

Attorneys are liable for loss to clients resulting from carelessness or ignorance of the law in examining and giving opinions on land titles, etc.

In many cases, attorneys have been held liable for losses resulting from their failure to take prompt and careful steps for the collection of claims entrusted to them.

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MODERN PUMP EQUIPMENT

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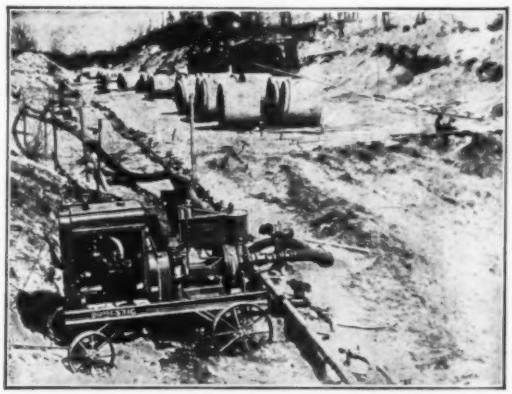
No carrying water to fill priming receptacles or pump
Centrifugal Pump Unit

High Vacuum or Suction Lift
27 feet possible

Popular Sizes:- 2½", 3" 4" and 6" Suction and Discharge Pumps



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Carried in stock by Distributors in principal cities throughout the U. S. A.

Ball Bearings Extra Heavy Shaft

Trash Handling Impeller—special open passage type.

Automatic Controlable—Positive Primer *(No foot-valve used)*

Large Capacities—from 200 up to 1400 Gallons per Minute.

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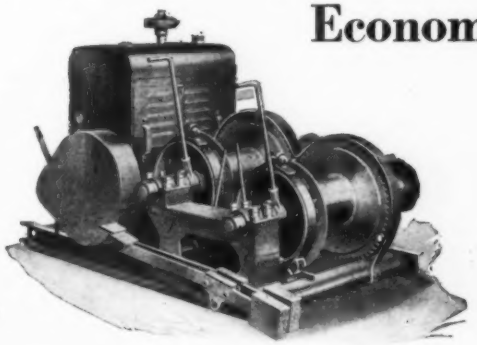

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Write today for the new DAKE catalog. Inform yourself about DAKE gasoline and electric hoists ranging from 2 to 27 hp. and priced from $250.00 to $1,900.00 f.o.b., factory.

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Construction Industry News

Euclid Crane & Hoist Co., Euclid, Ohio, has recently completed an addition to its Euclid wagon division which covers about 10,000 square feet and increases the floor space of the plants to approximately two acres. This additional space will be devoted to the manufacture of the new Euclid bulldozer and other equipment.

J. H. Welch, 21 Terrace, Buffalo, N. Y., has recently introduced a new forming system in the East, which is known as the RooSpeed forming system. It is being used by the John W. Cowper Co., Inc., on the Clinton Street Produce Terminal of the Erie and Nickle Plate Railroads at Buffalo.

Universal Atlas Cement Co., Chicago, Ill., has announced the transfer of E. M. Johnson, Assistant Treasurer, from Pittsburgh to the Chicago office. A. B. Wells, Assistant Eastern Credit Manager at Pittsburgh for 12 years, has been appointed Assistant Treasurer and will be located in that office.

James W. Owens, formerly Director of Welding at the Newport News Shipbuilding & Drydock Co., Newport News, Va., has, with Professor C. A. Adams, of the Harvard Engineering School; C. A. McCune, J. H. Deppeler, Leon S. Moisseiff and A. V. deForest, organized the Welding Engineering & Research Corp., 25 West 43d St., New York, N. Y. Mr. Owens will be the Director of Engineering and Secretary of this company, the divisions of which are engineering, research, consulting, inspection and certification. The company plans to have a $100,000 research laboratory fully equipped by January 1, 1931.

Link-Belt Co., 300 West Pershing Road, Chicago, Ill., announces that B. H. MacNeal has been appointed Southern District Manager of the Crane-Shovel-Dragline Division of the company, with headquarters at the company's Birmingham office. He will have charge of the territory between the Mississippi Valley and the east coast, south of and including Tennessee and North Carolina.

Paradon Manufacturing Co., Arlington, N. J., makers of Paradon chlorinators, have announced the appointment of S. S. Williamson as Manager of Advertising and Publicity. Mr. Williamson was formerly Publicity and Advertising Manager for the Lidgerwood Mfg. Co., Elizabeth, N. J.

LeTourneau Manufacturing Co., Stockton, Calif., has announced that it has increased its production force by 15 mechanics and has added J. W. LeTourneau, Sales Manager, and O. H. Barnhill in charge of publicity.

Allis-Chalmers Manufacturing Co., Milwaukee, Wis., has appointed B. Hayman Co., Inc., 118-128 Los Angeles St., Los Angeles, Calif., as distributor to handle its line of industrial and agricultural tractors in the Southern California territory. In connection with this distributorship they will also handle the line of industrial equipment built by the various manufacturers for this tractor. This will include hoists, graders, shovels, loaders, road rollers, bulldozers, locomotives, street sweepers, cranes and oil field equipment. The Crook Co., Los Angeles will continue as the Allis-Chalmers Monarch distributor.

Caterpillar Tractor Co., Minneapolis, Minn., San Leandro, Calif., and Peoria, Ill., has been granted a license by the Patents Holding Corp., Frederick, Md., to manufacture power propelled road graders and maintainers under patents controlled by the Patents Holding Corp., according to W. A. Riddell, President of the corporation.

Independent Pneumatic Tool Co., 248 South Jefferson St., Chicago, Ill., has transferred W. A. Nugent, Manager of the St. Louis office, to Chicago, as Manager of the Chicago territory. F. J. Passino, Manager of the Pittsburgh office, has been made Manager of the St. Louis territory and T. J. Clancy of the Cleveland office will be transferred to Pittsburgh as Manager of the Pittsburgh territory. This company also recently appointed the Mine & Smelter Supply Co., Salt Lake City, Utah, as its agent. It will handle the complete line of Thor tools in its own territory and also has branch offices in Denver, Colo., and El Paso, Texas.

Trackson Co., Milwaukee, Wis., has announced the appointment of the Northern Road Equipment Co., 82 St. John St., Portland, Maine, as distributors of Trackson tractor equipment.

Western Wheeled Scraper Co., Aurora, Ill., has announced the transfer of R. A. Ruble from the Atlanta office to St. Louis. Mr. Ruble takes the place of J. A. Cordeal, who has been in charge of the St. Louis branch, and who has resigned after nearly forty years' service. R. L. Ruble will remain in charge of the Atlanta office. The warehouse of Western tools, machines and repairs in Atlanta will be handled through the warehouse of the Austin-Western Road Machinery Co., 389 Whitehall St.

A. M. Byers Co., Clark Building, Pittsburgh, Penna., has announced the transfer of H. R. Rowland, Division Manager of Philadelphia, to be Division Manager of Pittsburgh. E. L. MacWhorter representing Byers in Western New York has been promoted to Division Manager, with headquarters in Philadelphia. The National Sales Meeting of A. M. Byers Co. is to be held at Pittsburgh October 8, in conjunction with the official opening of the company's new $12,000,000 plant for manufacturing wrought iron under the Aston patents.

Lima Locomotive Works, Inc., New York, has moved its offices to the Lincoln Building, 60 East 42nd Street.

1929 Big Year in Construction Explosives

ACCORDING to the best available estimates, approximately 45,000,000 pounds of explosives were used for general construction work throughout the United States last year, making 1929 the biggest year in construction explosives. During the first quarter of this year approximately 10,000,000 pounds of dynamite were used, indicating that there will be a 14 per cent increase in the use of explosives in 1930 over 1929. The range of construction work in these figures included all kinds of construction work from the boring of a railroad tunnel to the erection of a skyscraper. Almost every conceivable form of construction is made possible by explosives, so that the manufacture of explosives has become a "key" industry.

An interesting point in connection with the large amount of explosives used for construction purposes last year in practically every state in the Union was that not a life was lost in the transportation of the explosives, and the damages and injuries in the handling of explosives for construction purposes was negligible, far less than in any other industrial activity.

21 improvements give *greater digging power* to the new WILLIAMS Champion 227

DIG it with a new WILLIAMS "Champion"

Definitely guaranteed to outdig any bucket built.

Make your own tests and comparisons. Write us—we'll make the arrangements.

A real Champion welcomes competition.

G. H. WILLIAMS COMPANY
609 Haybarger Lane, Erie, Pa.
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WILLIAMS
BUCKETS — TRAILERS

Here are 5 of a fleet of 21 dump trucks in Cleveland, all of which are equipped with Wood F-4C all-steel, hydraulic hoists, of the new, improved, slant type, and Wood W-12 all-steel dump bodies of 4-yard capacity.

FLEET OWNERS SPECIFY WOOD

The experience of fleet operation quickly tells the worth of a hoist or body. As a result, fleet owners purchase dumping equipment, not on a basis of first cost, but on a basis of profit-producing service.

They are quick to appreciate improvements that mean greater profit from operation.

Their purchases of the new Wood improved slant type all-steel hoists, and the modern Wood all-steel dump bodies is sufficient approval of the worth of these units.

The policy of many individual-unit operators, who buy Wood dumping equipment on the strength of the fleet owner's use of it, also has shown that it is a profitable practice to be guided by their choice.

SEND FOR ILLUSTRATED BULLETINS DESCRIBING WOOD DUMPING EQUIPMENT

WOOD HYDRAULIC HOIST & BODY COMPANY
DETROIT • BRANCHES AND DISTRIBUTORS IN PRINCIPAL CITIES • MICHIGAN

Distributors' Bulletin Board

New Lines Carried by Construction Equipment Sales Organizations

Additional information in regard to the lines carried by Distributors may be found in the Directory, pages 129 *to* 156 *of this issue of* CONTRACTORS AND ENGINEERS MONTHLY.

Ensminger & Co., 181 S. Washington St., Wilkes-Barre, Penna., has recently added to its line of contractors' equipment Butler bins, made by the Butler Bin Co., Waukesha, Wis.; Jackson wheelbarrows and concrete carts, manufactured by the Jackson Mfg. Co., Harrisburg, Penna.; Blaw-Knox buckets, a product of the Blaw-Knox Co., Pittsburgh, Penna.; Adams graders, made by the J. D. Adams Co., Indianapolis, Ind.; and Hotchkiss road forms, manufactured by the Hotchkiss Steel Products Co., Binghamton, N. Y.

Construction Equipment Co., 1118-1124 Ide Ave., Spokane, Wash., has added the following to its list of accounts; Climax Engineering Co., Clinton, Iowa; Kalamazoo Railway Supply Co., Kalamazoo, Mich., and Fairbanks, Morse & Co., Chicago, Ill.

Bauer Tractor Co., Inc., 81 Water St., Bridgeton, N. J., is now representing the Euclid Crane & Hoist Co., Euclid, Ohio, in addition to the companies previously represented.

Complete Machinery & Equipment Co., Inc., Webster Ave. and Hancock St., Long Island City, N. Y., has recently taken on the line of Humdinger self-priming centrifugal pumps which are manufactured by the Ralph B. Carter Co., Hackensack, N. J.

Barnard Tractor & Equipment Co., 15th and Mayflower Sts., Harrisburg, Penna., has added Euclid Crane & Hoist Co., Euclid, Ohio, to its list of accounts.

Allegheny Equipment Corp., 1524 Grant Bldg., Pittsburgh, Penna., has recently added Gardner-Denver compressors and drills, made by the Gardner-Denver Co., Denver, Colo., to its line of contractors' equipment.

Herman M. Brown Co., Omaha, Nebr., and Des Moines, Iowa, has recently taken on Hughes-Keenan Iron Mules, made by the Hughes-Keenan Co., Mansfield, Ohio, and Walter Snow Fighters, manufactured by the Walter Motor Truck Co., Long Island City, N. Y.

Dale & Rankin, Inc., 113-115 Frelinghuysen Ave., Newark, N. J., has made the following additions to its line of contractors' equipment: Marsh-Capron and Wonder mixers, made by the Construction Machinery Co., Waterloo, Iowa; Superior saw rigs, made by the Jones Superior Machine Co., Chicago, Ill.; and Aeroil heaters and torches, products of the Aeroil Burner Co., West New York, N. J.

McNeilly Machinery Co., 337 South High Street, Columbus, Ohio, has recently been made distributor for Byers ½ and ⅜-yard gasoline cranes, draglines and shovels, made by the Byers Machine Co., Ravenna, Ohio, and for steel bins, manufactured by the Butler Bin Co., Waukesha, Wis.

Fuchs Equipment Co., Omaha, Nebr., is now handling Bates bar ties made by the Bates Valve Bag Co., Chicago, Ill., in addition to the other lines previously handled.

Garlinghouse Bros., 2044 Santa Fe Ave., Los Angeles, Calif., added to its line of contractors' equipment Ransome concrete equipment, made by Ransome Concrete Machinery Co., Dunellen, N. J.; National hoists, manufactured by the National Hoisting Engine Div., McKiernan-Terry Corp., New York; and Bureh spreaders, made by the Bureh Corp., Crestline, Ohio.

Tractor & Equipment Co., 520-522 Passaic Ave., Newark, N. J., is now distributor for Unit shovels, clamshells and cranes, made by the Universal Power Shovel Co., Milwaukee, Wis., in addition to the lines previously handled.

Western Material Co., Sioux Falls, S. D., has added Euclid Crane & Hoist Co., Euclid, Ohio, to its accounts.

Mahoney-Clarke, Inc., 217 Pearl St., New York, N. Y., is now distributor for MarlO pumps, made by A. S. Marlow, Ridgewood, N. J.

Evans Tractor & Equipment Co., Rapid City, S. D., has recently been appointed distributor for the Euclid Crane & Hoist Co., Euclid, Ohio.

Hubbard-Floyd Co., Inc., 167th St. & Sedgwick Ave., New York, has added the Huber Mfg. Co., Marion, Ohio, to its accounts.

K. B. Noble Co., Hartford, Conn., has recently taken on the line of Heltzel bins and batchers made by the Heltzel Steel Form & Iron Co., Warren, Ohio.

Brown & Sites Co., 30 Church St., New York, has recently been appointed distributor for the Lawrence Machine & Pump Co., Lawrence, Mass.

Dyar Sales & Machinery Co., 66 Broadway, Cambridge, Mass., has recently added to its line of equipment Gilson concrete mixers, made by Gilson Bros. Co., Fredonia, Wis., and snow fence manufactured by the Illinois Wire & Mfg. Co., Joliet, Ill.

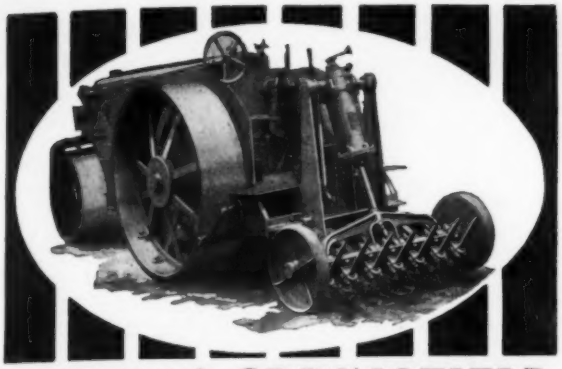
Bauer Tractor Co., Inc., 81 Water St., Bridgeton, N. J., has recently added the Euclid Crane & Hoist Co., Euclid, Ohio, to its accounts.

H. M. Hirschfeld, 16th Ave. & 59th St., Brooklyn, N. Y., has added the products of the Conneaut Shovel Co., Conneaut, Ohio, to its line of contractors' equipment.

Robert T. Twedt Co., 15th & Pioneer Sts., Cheyenne, Wyo., has recently been appointed distributor for the Euclid Crane & Hoist Co., Euclid, Ohio.

A Primer on Efflorescence

THIS is a 4-page folder containing questions and answers on the nature, sources, cure and prevention of efflorescence on brick masonry, by Major L. B. Lent, Engineer, and reprinted by permission by the Common Brick Manufacturers' Association, 1716 Grand Central Terminal, New York, from whom copies may be secured on request.



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Built in a wide range of sizes. Steam and motor driven. Three-wheel and tandem.
Scarifier and other attachments optional.

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There is an interesting Booklet on Rollers waiting for you.

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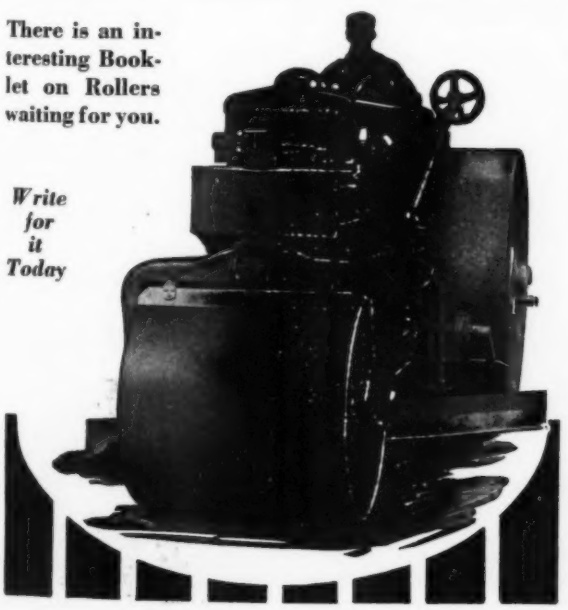

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THIS New England crawler type loader sets a new standard of efficiency in the handling of sand, gravel and stone in large quantities. Speed in loading, speed in transportation and one-man operation cut loading costs to a minimum.

Built throughout with the best materials this machine will give you continuous, efficient service for many years, under the most difficult circumstances.

As pioneers in the manufacture of material handling equipment we would appreciate the opportunity of letting our experience be your guide in pointing out the most economical method of doing your particular job. We have done it for others—we can do it for you.

NEW ENGLAND ROAD MACHINERY CO.

Manufacturers of Power Loaders, Crushers, Screens, Washers, Elevators, Feeders, Conveyers, etc.

Write for catalog of the equipment of particular interest to you.

163 C STREET SOUTH BOSTON, MASS.

The New Marion Type 450 Excavator

A New Electric, Gas-Electric or Diesel-Electric Excavator

THE new Marion Type 450 electric, gas-electric or diesel-electric 1¼-cubic yard excavators, made by the Marion Steam Shovel Co., Marion, Ohio, are constructed exactly the same except for the power plant at the rear of the machinery frame, and the slip rings on the electric. The advantages of gasoline or diesel drive are combined with the advantages of electric drive on the internal combustion units.

Type 450's underframe is made of cast steel, one piece, heat-treated, and box-sectioned. These box sections are tied together by heavy webs, all bolts, rivets and so forth in the underframe having been eliminated. All rotating members are bronze bushed and proper lubrication provision is made. Heavy steel rollers, which are enclosed in the side frames, are spaced closely together so that the machine lays down a track for itself and evenly distributes its load. A digging brake is provided of the outside band friction hand set type. After moving forward this brake is set easily and quickly with a handwheel, and the machine will not back away from the work under the urge of the handle thrust. These 450 crawlers may be buried by a slide or cave-in and still be able to propel out of the position. For further protection against falling boulders or cave-ins lubricating devices are recessed in the side frames and covered by pipe plugs.

A single steel casting carries all the operating machinery on the upper or rotating frame. The frame is supported by four machined conical rollers, moving on a machined path which is a part of the main rotating gear. All machinery having rotating members except the power plant is secured to the frame casting itself to insure accurate alignment.

For electric operation the incoming lead wires are anchored to the lower frame and brought up through the center journal. Here they are connected to the rings of the slip ring arrangement at the top of the center journal. From the slip rings the wires are brought to a starting box and thence to a 40-horsepower driving motor. Direct connected to this motor is a 25-kw direct current generator, which converts the incoming or supply current into direct current of the proper characteristics to produce the most efficient operation. The generator is built with a special winding to produce variable voltage characteristics, making possible high dipper speeds when the load is light and high bail pull when it is heavy. The current from the generator is split into three major circuits which are controlled by the operating levers on the control switches. From these the current passes to the three motors, a 23-horsepower for hoisting and 9½-horsepower each for rotating and crowding. These are of the latest design of mill type, reversible motor, having roller bearings, built-in fans and mica insulated armatures. A separate motor driven air compressor supplies air for the operation of the ram for the outside band on the hoist drum and for the operation of the crowding lock brake. This latter brake is an automatic device which will hold the dipper handle in any positon when the crowd motor circuit is broken, as the brake is spring set, air released and magnetically controlled.

The gas-electric drive is exactly the same as the electric, with the exception of a gas engine replacing the motor and the slip rings, which are not necessary. The gas engine is a 92-horsepower unit, direct connected to the generator, which is mounted on the same base. A gasoline pump permits easy filling of the 75-gallon tank, and other accessories include governor, air cleaner, oil purifier, primer for easy starting, and oil pressure gage and electric starter.

The diesel-electric is also exactly the same as the electric except for the engine and slip rings. The diesel engine is a 92-horsepower, 1,000 rpm unit. It is compressorless and utilizes the solid injection principle, has dual nozzles in cage type mountings, enclosed fly wheel, force feed lubrication, cast crankcase, cast cylinders with removable sleeves, and is of the four-stroke cycle type. Accessories used with this engine include a throttling governor, air cleaner, oil filter, oil tank, oil pressure gage, 2-cylinder air cooled gasoline starting engine with Bendix drive. The fuel tank is horizontal, mounted above the engine. It has a capacity of 50 gallons and is filled by means of a hand-operated pump.

This excavator carries the inside handle and well-type boom. Wood members are armored inside and out with heavy plates, full length, and reinforced top and bottom with heavy bars. The boom foot is a one piece alloy steel casting which fits in a recess cast in the rotating frame. The boom or crowding machinery consists of an enclosed motor, which is geared through an intermediate shaft to the shipper shaft. The central portion of the shipper shaft is squared to carry the manganese steel shipper shaft pinions, which mesh with the racking on the handle. A spacer block is attached to the side plate in such a way that it fills the space between the two handle members, making the two members act together when side loads are put on the dipper and preventing the spreading of the dipper handle members. The dragline and crane boom is of the box or lattice type made of structural steel forms. Point sheaves are of large diameter, bronze bushed and have machine cut grooves. The entire front end equipment is built to withstand severe service and to maintain a balance with the rest of the machine.

A New Road Torch

FOR use on road and other outside construction work the Consolidated Iron-Steel Mfg. Co., 1290 East 53rd Street, Cleveland, Ohio, has developed the T & B torch. These torches are of the best quality gray iron with joints accurately fitted and are practically unbreakable.

The shape of the torch makes it practically impossible to tip it over accidentally and the new type of improved burner makes for economy of oil. It is claimed they are easily cared for, requiring a minimum of time for refilling and conditioning, the shape affording great stability without artificial ballast, and they will stay lighted in all weathers.

The T & B Road Torch

HEAT
for Your Concrete Mixer

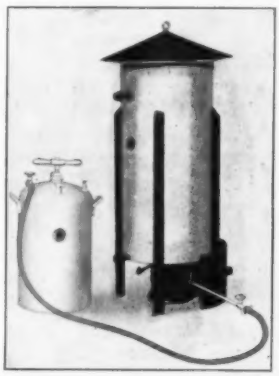
Littleford Universal Concrete Heater Units for Tilting and Non-Tilting Drum Mixers will go a long way to help solve your winter heating problems. Whether your mixer has a 3½ or a 28 cubic foot capacity—Littleford has a unit to fit it *—and do a real heating job.* The Universal Attachment can be placed on mixers of any make. *There are no brackets or braces to fool with—no holes to drill.* Write for full particulars. Be sure to tell us the make, type and size of your mixer.

ON TILTING DRUM MIXER

There is no other heating attachment so perfectly devised for use on tilting drum mixers of every make. Notice that the mixer operator is within easy reach of the heater. See how simple it is for him to swing it toward or away from the drum.

THE LB WATER HEATER

Outside temperature 18 degrees F. Temperature of water entering water heater 33 degrees. Temperature of water leaving heater at the rate of 300 gallons per hour, 175 degrees! How is that for a supply of hot water? Now is the time to get complete information on Littleford Water Heaters.



LITTLEFORD
CONCRETE HEATER UNITS
for Tilting & Non-Tilting Drum Mixers
LITTLEFORD BROS. 485 E. PEARL ST. CINCINNATI, O.

FREEMAN
4 wheel drive trucks

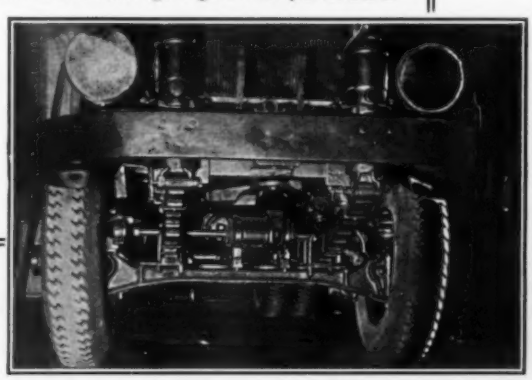
You don't hear much of "William the Conqueror" these days—but you *do* hear a lot about "FREEMAN THE CONQUEROR."

The new FREEMAN Four Wheel Drive, Front Wheel Steer, Truck "conquers when all other trucks fail."

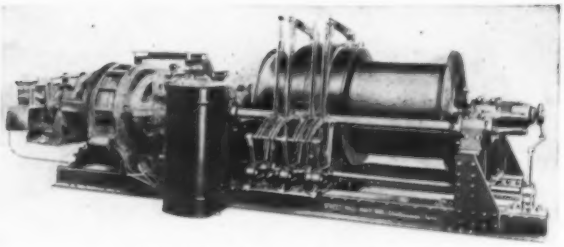
Easy steering. High power. Victor of every road condition:—loose sand—slippery mud—snow. Ideally adapted for snow removal and maintenance jobs. Fast enough on paved roads for express service. Eight speeds forward, two reverse.

The FREEMAN Four Wheel Drive Truck will reduce your truck costs per ton mile. Its economy of operation is amazing! ***Write for our illustrated booklet giving further particulars.***

FREEMAN MOTOR COMPANY
DETROIT U. S. A. MICHIGAN



WHAT YOU WANT IN A TRUCK YOU'LL FIND IN A FREEMAN



The New Street Bros. Hoist

New Electric Cableway Hoist

A DEPARTURE from standard construction is shown in the structural electric-welded and riveted, steel frame or base of the new type electric cableway hoist made by Street Bros. Machine Works, Chattanooga, Tenn. Pads are welded to the flange of beams which are machined accurately for the bearings. Post type brakes are another feature of this hoist. Hand-operated levers for controlling the frictions and brakes are in bank.

The accompanying illustration shows one of these hoists recently shipped to the Appalachian Power Co. Special electric equipment is furnished to give a slow creeping speed and a solenoid brake is also standard equipment.

Transporting Ready-Mixed Concrete

TO make the best possible concrete from given ingredients, they must be thoroughly mixed by rough handling, a cutting under, elevating, cascading, kneading and spreading action brought about in a machine especially built for this purpose. This machine must be of heavy construction because the work is severe. As one solution of the ready-mixed concrete problem, Norris K. Davis, Inc., 400 Seventh St., San Francisco, Calif., offers the new Davis concrete transfer system, using a Davis central mixing plant where the concrete is first correctly proportioned by weight or volume or both and where the inspector can regulate the water and cement ratios and control them so that the architects' and engineers' specifications are correctly filled, then using the Davis concrete transfer bodies to deliver the finished concrete.

This body can be mounted on any standard make of motor truck chassis and, due to its light weight, assures a pay load. It is not a concrete mixer but a concrete carrier and conditioner in which pre-mixed concrete is transported. On arrival at the mixing plant the watertight gate on top of the body is opened and the batch poured directly from the stationary mixer into the cylindrical body, the watertight gate then being closed by a simple device. The driver proceeds to the job, rotating the cylindrical body for about 200 feet only. The rotation is then stopped until within about 300 or 400 feet of the job, when the body is again revolved until the job is reached. The discharge gate is then brought to the bottom position and opened by a rack and pinion by which the concrete flow can be regulated either to discharge into wheelbarrows, buggies, buckets or directly into the forms as the job requires. The rear gate is then closed and locked and the truck returns to the plant. It is not necessary to revolve the drum to discharge the concrete, as the greater part pours out by gravity and it is only necessary to elevate the drum for low slump concrete.

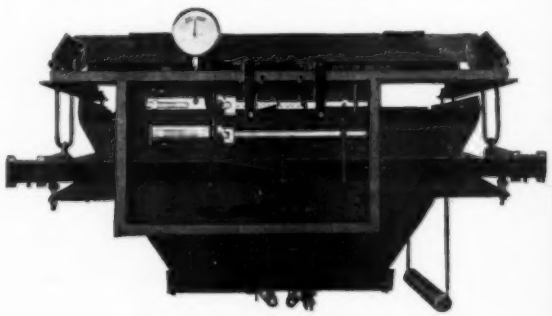
A Fleet of Davis Concrete Transfer System Trucks

A New Weighing Device for Bins

DESIGNED to meet the specifications of the Joint Committees of the American State Highway Officials and the Good Roads Association, a new weighing AggreMeter has been announced by the Erie Steel Construction Co., Erie, Pa.

This new piece of equipment is shipped completely assembled and ready to be attached to almost any type of bin. When ordered with the Erie type E, G or GA bins, it comes attached to the bin.

The gates of the AggreMeter are of the clamshell type and designed so as to close automatically, requiring very little headroom. The gate, which is positive in closing and easy to operate, is opened by giving a crank a quarter turn. When this crank is released, the gate closes itself.



The New Erie Weighing AggreMeter

The scale is of the charging type and has a beam for each material or size of material. On the two-compartment bins, a two-beam scale is furnished and on the three-compartment bins a three-beam scale. Each scale is equipped with an auxiliary dial which shows only the approach to the desired weight. The scale is as compact as possible and all knife edges are protected from the materials. These knife edges are properly hardened and ground and have very little movement, thus reducing the wear on these important parts and increasing the life of the scale.

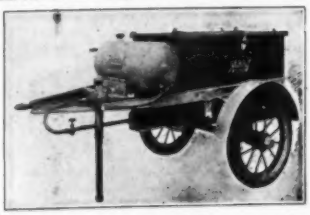
When the desired weight is once set on the scale beams it is unnecessary to move the poises until a different quantity of material is wanted. A beam box cover is regular equipment with the AggreMeter and can be locked so as to protect the scales.

A welded self-cleaning material box is used and excess material can be taken from the box on all sides. The draw-off doors close automatically and when closed a positive catch locks the doors, making it impossible to open them until the trip rope is again pulled. Ball bearing pulleys are used to assure easy and positive action of the counterweight. This machine is made in sizes to accommodate 1, 1½, 2 and 3-cubic yard mixers.

Hotstuf

Here are a few comments from HOTSTUF owners

"Our heating time is cut in half."
"Your heater is superior in every respect."
"A great saver in time and material."
"The best we know of . . ."
"Hotstuff in almost a moment's notice."
"Will pay for itself in a very short period."
"Underestimated."
"All marvel at the way it turns out the hotstuff."



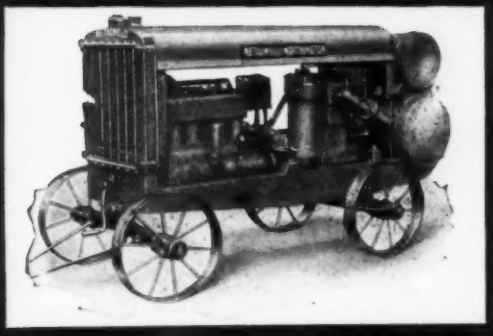
Hundreds of contractors and construction companies use Hotstuf Heaters. Hundreds of these contractors would use no other. Performance is what counts and that is the reason so many contractors prefer Hotstuf.

All steel Mohawk Hi-Speed Trailer Tool Boxes are companion equipment to Hotstuf Heaters. A modern tool box for progressive contractors.

Write for Catalog

MOHAWK
ASPHALT HEATER CO.
68 WEAVER ST., SCHENECTADY, N. Y.

M-W AIR KING



The world's finest portables—
Made in 28, 75, 110, 220, 280 and 230 cu. ft. sizes, mounted as "towabouts," trailers, motor trucks, railcars and tractors. Catalog on request. Dealers in principal cities.

METALWELD, INC.
26th & Hunting Park Ave., Philadelphia

METALWELD-WORTHINGTON
PORTABLE AIR COMPRESSORS

WARCO RUBBER CRAWLERS

FOR SHOULDER WORK

Here is the answer to the problem of damaged surfaces and marred pavement. WARCO Model "TR" Rubber Crawlers give plenty of traction, with quiet, smooth operation for fine grading and maintenance. Interchangeable with WARCO Steel Crawlers for heavy work where rubber won't do.

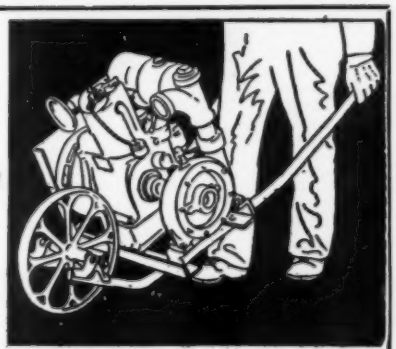
Get full details on WARCO Crawlers now. It will pay you.

W. A. RIDDELL COMPANY
BUCYRUS OHIO

Power and Drawn Graders, Wheeled Scoops, Rear-Type Crawlers

Rex Water Boy

$170.00
LIST AT MILWAUKEE



Light-weight champion of the world. Only 300 lbs. Yet handles up to 9,000 G.P.H.—develops heads up to 55 ft. Mounted on wheelbarrow frame for easy handling. Centrifugal pump, open impeller type, passes dirt. Engine, air-cooled, fully enclosed and self-oiling, high tension magneto.

REX PUMPS

CHAIN BELT COMPANY
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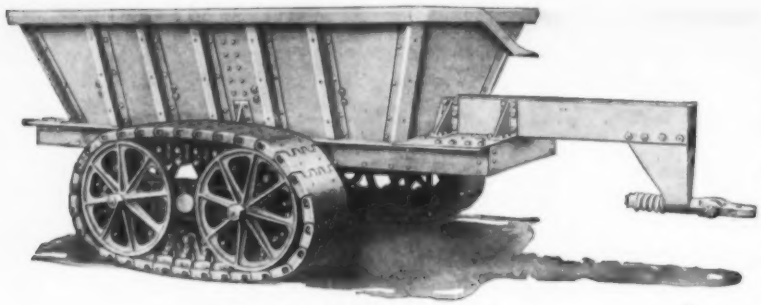
Get the catalog on the Water Boy, light weight champ—and the Rex Pump Line—use this coupon.



The Dreadnaught BD 7-S Wagon

Crawler Mounted Dump Wagons

A NEW crawler dump wagon has recently been developed by the Electric Wheel Co., Crawler Wheel Div., Dept. BD, Quincy, Ill., in which the drawbar is a box section H-beam anchored in massive steel castings to withstand the terrific jerking and twisting strains encountered in hauling service. The dumping doors are hung on simple trouble-free chain hinges and to insure more than ample strength, they are constructed from heavily reinforced 3⅜-inch steel plates. Extra heavy pressed steel sections have been used for the body braces and top edging.

The center axle of the Dreadnaught crawler wagon is 4¼-inch chrome nickel steel and the main frame is built of heavy structural sections ¾-inch thick which, combined with the heavy center bracing and the frame and axle design, overcomes any tendency to frame spread or axle spring under load.

This wagon is available either with hand-operated or mechanically operated wind-up for the bottom doors. Steam shovel flare boards are also optional equipment, as is a special heavy-duty drawbar for use with the Caterpillar Sixty.

Stump Pullers for Use with Tractors

FOR use in clearing stumps from land, the Dorsey Model B stump puller which is adaptable to most types of crawler and industrial tractors is made by Dorsey Brothers, Elba, Ala.

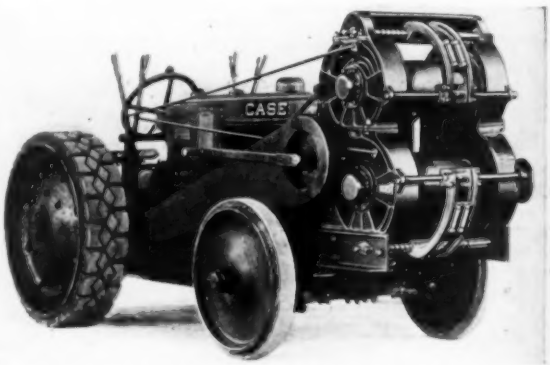
In this equipment electric process steel, electrically annealed is used throughout, insuring great endurance and long life. The frame construction is of 8-inch rolled steel channels with cross members securely attached by hot riveting, frame, cross members and braces being drilled according to template specifications, insuring operating ease and eliminating resistance of irregular loads being transmitted to any one point of suspension.

The drum is of a grooved type, and drum and trunnions are constructed of steel with the journals running in large bearings and drum gears securely attached with keys.

The stump puller is designed to develop a tensile line pull of large tonnage capable of handling any type of work, independent of the size or soil conditions. Power is transmitted to the drum gears by two opints of driving, properly timed so that irregular loads are not applied to any one point. Standard low gear reduction has a ration of 250 to 1 with an approximate line speed of 8 feet per minute. A steel drawbar plate is furnished for attaching to the Caterpillar tractor, the frame extensions being secured to the plate with two pins, only a few seconds being required to attach or detach the unit while on the wheel type a steel clamping device is used.

The accompanying illustration shows one of these machines engaged in clearing the site for the Southern Kraft Co.'s new $5,000,000 paper mill recently constructed at Panama City, Fla., by the Brackin Construction Co. of Mobile, Ala.

Dorsey Model B Stump Puller Cleaning Ground for Paper Mill at Panama City, Fla.



The Model HC Trackson Hoist for Case Tractors

A New Portable Hoist

FOR handling concrete and other building materials, steel erection, double elevator operation, lifting heavy machinery, dragline excavating and other similar work, the Trackson Co., 1323 South First St., Milwaukee, Wis., has brought out its portable hoist in a new model, known as the HC, which is adapted to mounting on the Case Model CI industrial and Model C agricultural tractors.

Some of the many improvements and additions in this hoist which make for greater efficiency and economy are oversized drum shafts, stronger frames, improved clutches and the Trackson Level Wind, which prevents the cable from criss-crossing and bunching up. Operation is very simple and all of the controls are within easy reach of the operation. All moving parts are shielded.

This model can be obtained, either as a single or double drum hoist and either can be readily converted into the other type by merely mounting or detaching the upper drum. The patented Level Wind greatly reduces wear and tear on the cable. It winds evenly and smoothly, layer after layer, at all speeds and handles different size cables. Working with this device is an anti-back-lash which maintains proper tension and keeps the cable securely wrapped, even when the line ahead suddenly goes slack.

What are the Outstanding Features of all BURCH MACHINES?

FIRST

Rigid Construction
Economy of Operation

SECOND

Satisfactory Performance
Durability

THIRD

Every Convenience that can possibly be incorporated

BURCH CAR UNLOADER

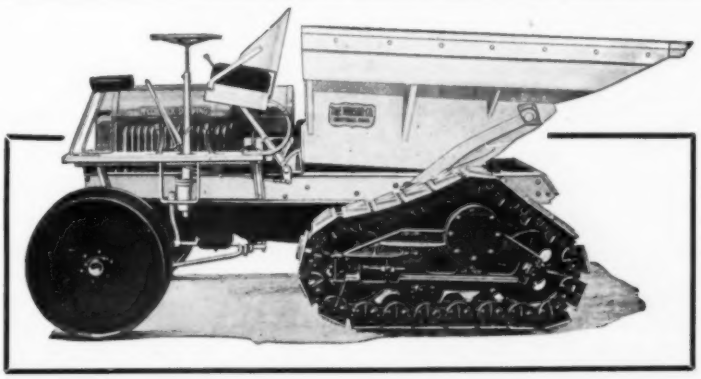
THE BURCH CORPORATION, *Write for our Catalog* CRESTLINE, OHIO

WINSOR GRAVITY DUMPS

Capacity 3 to 4 yards
Wheel or Crawler Type
Interchangeable in the field

Manufactured by

THE WINSOR CO.
BUCYRUS, OHIO



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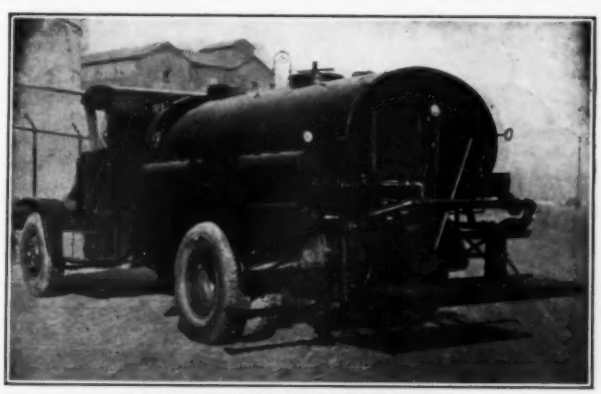


HVASS BITUMINOUS DISTRIBUTORS

The New Bay City Cranemobile

A New Convertible Shovel

INTENDED for work where hard surface conditions favor a rubber-wheel-mounted machine, rather than crawlers, the new Bay City Cranemobile, which is a development of the Bay City tractor shovel, has been announced by Bay City Shovels, Inc., Bay City, Mich.

This machine is convertible and, in addition to standard crane attachment, such as clamshell, hook and block, electric magnet, etc., it is available with shovel dipper, trench hoe or skimmer bucket. Three speeds forward up to 7 miles an hour and one speed reverse are available.

For power either McCormick-Deering or Allis-Chalmers industrial tractor is used. The Cranemobile is not a tractor attachment but has the tractor installed as a permanent power unit. It has an overall width of 8 feet, a wheelbase 11 feet, 11 inches long and a turning radius of 30 feet.

A New Lighting Cable for Construction Camps and Tunnels

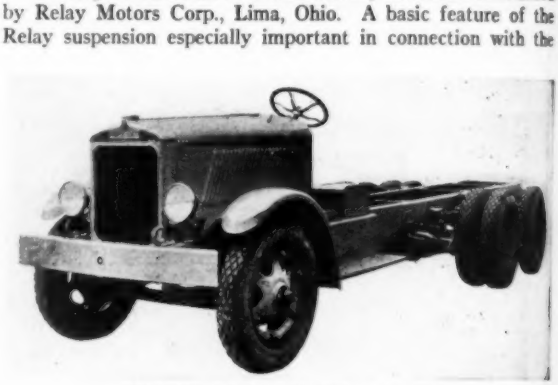
A NEW cable has been developed which will withstand the severe demands of underground lighting service as well of quarries, open pits and construction jobs. This Stringalite safety lighting cable, made by the Sullivan Machinery Co., 814 Wrigley Bldg., Chicago, Ill., provides the safety and utility of a permanent installation with the wiring simplicity and economy of a temporary job.

Among the important features are that installation, extension or removal may be done quickly and easily by workmen on the job, it may be hung over any projecting object, such as a nail, timber or bracket, requiring no insulators or special supports. There are no taped joints to give trouble, 100 per cent salvage value is secured upon removal or change of location, ample light is provided where it is needed, the light may be extended to any required distance from the current source, sockets and connections are practically unbreakable, standard lamp guards may be used and a heavy coat of tough molded rubber covers the cable, connectors and sockets in one piece, thoroughly insulating each part against electrical leakage, and providing perfect protection against moisture, corrosion and rough handling. Stringalite is a molded rubber standard No. 102-conductor light cable into which molded rubber covered porcelain lamp sockets are vulcanized at 33 1/3-foot intervals. The cable and connectors are tested at 1,500 volts. Molded rubber blank screw plugs are used to seal the light sockets that are not in use, the whole providing a moisture and corrosion-proof and safe lighting system. This cable is carried in stock in lengths of 100 and 200 feet, with 3 lamp sockets to every 100-foot length and end connectors attached.

The Sullivan Stringalite Safety Lighting Cable

Six-Wheel Trucks of New Design

TWO new six-wheel models of the two-wheel drive type, in which the Relay pendulum suspension has been incorporated on all four rear wheels, have been announced by Relay Motors Corp., Lima, Ohio. A basic feature of the Relay suspension especially important in connection with the two-wheel-drive, six-wheel truck, is the fact that the upward swing of the load automatically increases the downward pressure on the wheels, greatly adding to the traction.



The New Relay Six-Wheel Truck

The engine in both models is a 6-cylinder, removable L-head type, the 50 SW engine having a 3¾-inch bore, and 5-inch stroke, and the 60 SW engine at 4⅛-inch bore and 5⅛-inch stroke. Three-point suspension and force-feed lubrication to all crankshaft, camshaft and connecting rod bearings are offered in both models.

The transmission is of the selective gear type mounted in unit with the clutch. There are five speeds forward and two reverse, a pad being provided for power take-off.

The front axles of both models are of the reverse Elliott type, drop-forged I-beam section, one piece construction with taper roller bearings in the hubs. The driving and trailer rear axles, which are flexibly connected, are of the oscillating Relay type, assuring added traction in starting and maximum cushioning of the chassis and load under all operating conditions. There are two complete sets of brakes on each model, operating independently. Service brakes are of the Lockheed hydraulic type internal expanding and operating on all six wheels. The hand brake is external contracting on the propeller shaft.

THESE CATALOGS ARE FOR YOU

These especially selected catalogs and pamphlets of value to contractors are for free distribution. You will find it worth while to check these lists each month and write for the catalogs you need.

A NEW 1¼-CUBIC YARD EXCAVATOR
Bulletin No. 343, describing the new Marion Type 450 electric, gas-electric or diesel electric 1¼-cubic yard excavators, which are constructed exactly the same except for the power plant at the back end of the machinery frame, may be secured from the Marion Steam Shovel Co., Marion, Ohio.

METAL FOR FUSION WELDING
Armco ingot iron for use in fusion welding is described in a 40-page booklet entitled "Better Welds with Armco Ingot Iron," which the American Rolling Mill Co., Middletown, Ohio, will be glad to send to those interested.

A NEW HEAVY-DUTY 27-E PAVER
A 43-page booklet describing the new Koehring 27-E paver, the outstanding feature of which is the autocycle, a means of providing a fast exact automatic sequence of batchmeter timed operations, may be secured by those interested from the National Equipment Corp., 30th Street and Concordia Avenue, Milwaukee, Wis.

A TWO-WHEEL SCRAPER FOR USE WITH TRACTORS
Literature describing the Shaw True-Cut two-wheel scraper for use with a tractor in digging, loading, hauling, dumping and spreading over short hauls may be secured by those interested from the Shaw Excavator & Tools Co., Worthington, Ohio.

A NEW ROAD TORCH
A folder describing the T & B torch for use on road and other outside construction work and which is practically unbreakable will stay lighted in spite of weather conditions, and cannot be accidentally tipped over and extinguished, may be secured on request from the Consolidated Iron-Steel Mfg. Co., 1290 East 53rd St., Cleveland, Ohio.

TWO-STAGE OXYGEN REGULATOR FOR GAS WELDING
Complete information regarding the Oxweld Type R-43 oxygen welding regulator which gives a freedom from fluctuation by means of a system of two-stage pressure reduction through two separate and independent sets of diaphragm, valves and springs for oxy-acetylene welding, may be secured on request from the Oxweld Acetylene Co., 30 East 42nd Street, New York.

A NEW BULLETIN ON SINKER DRILLS
The fifth edition of Bulletin 850 illustrating and describing C-P wet and dry sinker drills may be secured from the Chicago Pneumatic Tool Co., 6 East 44th St., New York.

A NEW 12½-25-HORSEPOWER GRADER
Bulletin 1146 describing the new 12½-25-horsepower dual drive motor grader, among the features of which are a heavy duty 6-cylinder motor and a unique type of driving mechanism, may be secured from the Austin-Western Road Machinery Co., 400 N. Michigan Ave., Chicago, Ill.

BULK MATERIAL HANDLING CONVEYORS
A new catalog No. 202 on bulk material handling conveyors, giving complete engineering data and illustrations on bucket elevators of all types, super-capacity elevators, bin gates, track hoppers and feeders, steel apron and pan conveyors, weigh larries and screw conveyors, will be sent on request by Chain Belt Co., 766 Park St., Milwaukee, Wis.

PORTABLE AIR COMPRESSORS
Sullivan Machinery Co., 814 Wrigley Bldg., Chicago, Ill., will be glad to send to those interested a copy of Catalog 83-R, describing the line of Sullivan vibrationless portable air compressors, to which has recently been added a 66-foot unit of the 2-cylinder vertical type, driven by direct connection to a Buda 4-cylinder, 4-cycle engine.

SPEEDY AND DEPENDABLE WHEELBARROWS
General Wheelbarrow Co., Cleveland, Ohio, will be glad to send to those interested literature describing its Speedbarrows, made in 2, 2½, 3, 3½ and 4-cubic foot sizes, all parts of which are interchangeable, and also its General double strength concrete cart which has an unbreakable hopper and many other features.

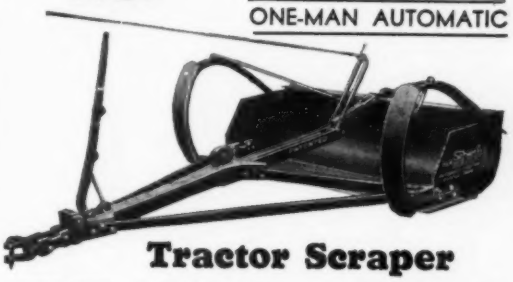
PORTABLE DRAG CONVEYORS
Fairfield portable drag conveyors which can be used with or without a portable feeder or in a gravity feeding pit and are built in lengths of 20 to 40 feet, and Fairfield power propelled drag conveyors which have all the features and construction of the portable conveyors with the advantage of self-propelled traction, are described in literature which the Fairfield Engineering Co., Marion, Ohio, will be glad to send on request.

Sturdy?

Look it over

Schaefer CLEVELAND

ONE-MAN AUTOMATIC



Tractor Scraper

STURDY—ECONOMICAL—LABOR SAVING

All three of these advantages are found in the SCHAEFER One-Man Automatic Tractor Scraper.

Nearly ten thousand in use the world over, developing roads, streets, grading parks, golf courses and airplane landing fields and in fact doing anything that is possible with a scraper.

It will pay you to investigate this outstanding tractor scraper. Do it today!

Four sizes: scraper widths, 4, 5, 6, 7 feet

Write for our circulars

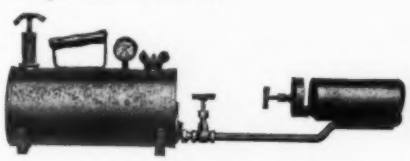
The Gustav Schaefer Company

4180 LORAIN AVENUE CLEVELAND, OHIO

Prepare NOW to Meet Winter Problems

Use Chausse Kerosene Torches to

Melt Snow and Ice; Thaw Fire Hydrants; Warm Concrete Mixers; Open Frozen Drains; Dry Paving Patches; and for many similar troubles.



You Can Save Money—

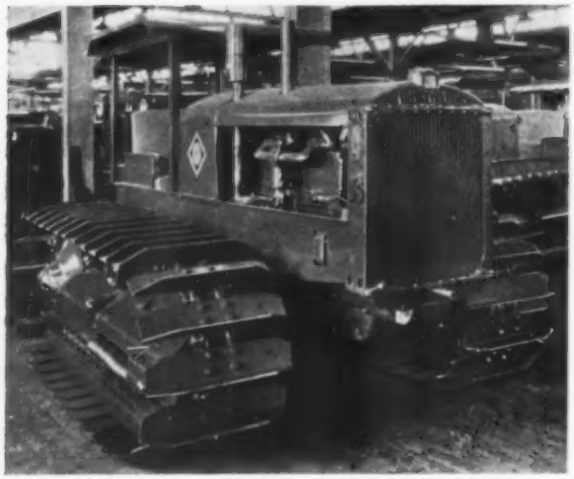
Chausse Torches are the Lowest-Priced Heating Torches Available.

Made in Hand and Hose Connected Types. Also mounted on wheels. Tank capacities of 3, 5 and 14 gallons.

Other products—Oil-Burning Surface Heaters, Fire Wagons, Tar Kettles, Portable Asphalt Plants. Write for illustrated catalogs

Chausse Oil Burner Company

Elkhart Indiana



Allis-Chalmers Monarch 35 with Wide Angle Track Shoes

New Track Equipment for Tractors

NEW track equipment for the Allis-Chalmers Monarch 35 tractor includes wide angle track shoes which are built in 18-inch, 24-inch and 28-inch widths and provide the extra traction needed for work in unusually loose soil, in swamps or on steep hillsides.

This equipment is used on the wide tread Monarch 35 now available. It gives the tractor greater stability on steep hillsides or for use with such equipment as side boom hoists or cranes.

In addition to the wide angle tracks, the Monarch 35, which is made by the Allis-Chalmers Mfg. Co., Milwaukee, Wis., can be equipped with standard tracks built in extra widths.

A Two-Stage Oxygen Regulator for Gas Welding

A CONSTANT line pressure free from any fluctuations is most desirable for good results with oxy-acetylene welding. The new Oxweld Type R-43 oxygen welding regulator recently introduced by the Oxweld Acetylene Co., 30 East 42nd Street, New York, gives a freedom from fluctuation by means of a system of two-stage pressure reduction. This is accomplished through two separate and independent sets of diaphragms, valves and springs. The full cylinder pressure of 2,000 pounds enters the regulator through a stem type valve and is controlled by the first stage diaphragm. In this stage the pressure is reduced to less than 250 pounds per square inch. This pressure will be constant for any one regulator, but varies somewhat with different regulators. The pressure here is not adjustable.

The New Oxweld 2-Stage Oxygen Regulator

The oxygen then passes from this first reduction assembly to a second stem type valve and diaphragm assembly where the pressure is reduced to the working pressure desired by the operator. This pressure is regulated by the operator by means of an adjusting screw and any operating pressure may be obtained without fluctuation.

The external appearance of the regulator is shown in the illustration. Instead of the usual handle type pressure adjusting screw found on all other Oxweld regulators, a screw with a ribbed cap has been substituted. This change in external design not only presents a neater and more compact appearance but will also avoid the possibility of breakage as there are no projections on the handle to be bent accidentally. The new type adjusting screw is of smaller diameter than the regulator itself so that it is easier to pack for transporation from one job to another.

A New Metal for Chains

A NEW line of cast chains, known as Promal, has recently been developed and announced by the Link-Belt Co., Indianapolis, Ind. They are the result of experimentation to provide longer life from drive and conveyor chains operating under heavy loads or abrasive conditions. This experimentation led to the discovery of a new method of processing malleable iron which so altered its physical characteristics as to make it a new metal.

A Link of Promal Chain

Promal has to a high degree the qualities desirable in sproket chain material, including toughness to resist extreme tension without permanent stretch, high strength in proportion to weight and size and hardness that affords great resistance to abrasive wear.

Promal chains are particularly designed for four general classes of service: chain drives, elevators, and conveyors operating under gritty or abrasive conditions; chain drives where unusual strength is required; drag, scraper and flight conveyors where the chain drags and is subject to abrasion; and heavy duty drives of comparatively high speed, short centers and large sprocket ratios.

The outstanding feature in the construction of an earth dam with a concrete corewell, which will be described in the November issue of CONTRACTORS AND ENGINEERS MONTHLY, *is the small number of men employed. This undertaking, which is being carried on in Delaware County, Pennsylvania, involves* 600,000 *yards of cut and fill, placing* 90,000 *tons of rip-rap and paving stone and pouring* 30,000 *yards of concrete.*

Do you check over this list each month? Get the Habit. It will save you money to be up-to-date on equipment

NEW TRACK EQUIPMENT FOR TRACTORS
Complete data regarding the new track equipment for the Allis-Chalmers Monarch 35, including wide angle track shoes, standard tracks built in extra widths and a wide tread in which the tracks are built further apart, will be sent without obligation by the Allis-Chalmers Mfg. Co., Milwaukee, Wis.

SIX-WHEEL TRUCKS OF NEW DESIGN
Two new six-wheel models of the two-wheel drive type, in which the Relay pendulum suspension has been incorporated on all four rear wheels, have been announced by the Relay Motors Corp., Lima, Ohio, who will send complete information on application.

CRAWLER MOUNTED DUMP WAGONS
A new crawler dump wagon which has recently been developed by the Electric Wheel Co., Crawler Wheel Div., Dept. BD, Quincy, Ill., in which the drawbar is a box section H-beam anchored in massive steel castings, is described in Form A482 of this company.

NEW ELECTRIC CABLEWAY HOIST
Street Bros. Machine Works, Chattanooga, Tenn., has developed a new type of electric cableway hoist in which the structural steel frame or base is electric welded and riveted, about which it will be pleased to tell contractors and others interested.

STUMP PULLERS FOR USE WITH TRACTORS
Dorsey Brothers, Elba, Ala., will be pleased to send copies of its catalog describing the Dorsey Model B stump puller which is adaptable to most types of tractors.

A NEW WEIGHING BATCHER
Complete data regarding the new weighing AggreMeter which has just been announced by the Erie Steel Construction Co., Erie, Pa., and which is shipped completely assembled and ready to be attached to almost any type of bin, is available to contractors on application.

A NEW CONVERTIBLE SHOVEL
Catalog T-6 of Bay City Shovels, Inc., Bay City, Mich., contains a complete description of the new Bay City Cranemobile which is intended for work where hard surface conditions favor a rubber-wheel mounted machine, rather than one on crawlers.

A HIGH SPEED RUBBER CRAWLER
The Model TR rubber crawler which is interchangeable with either the steel crawler or with rubber tired wheels on the same tractor axle, has been placed on the market by the W. A. Riddell Co., Bucyrus, Ohio, who will be pleased to send complete information on request.

A LIQUID WATERPROOFING COMPOUND
An 8-page folder describing Sika, a liquid compound for waterproofing new concrete or cement plastering as the work proceeds, waterproofing existing work where no water pressure is present or can be relieved during operations and waterproofing existing work where water pressure cannot be removed during operations, may be secured on request from the American Sika Corp., 56 West 45th St., New York.

A NEW METAL FOR CHAINS
A new line of cast chains, known as Promal, made by a new method of processing malleable iron which so alters its physical characteristics as to make it a new metal and which is particularly designed for drive and conveyor chains operating under heavy loads or abrasive conditions, is described in literature which Link-Belt Co., Indianapolis, Ind., will send on request.

A PUMP FOR WELL POINT WORK
Complete information regarding the MarlO self-priming centrifugal pump which is especially adaptable for well point work, will be sent on request by A. S. Marlow, Ridgewood, N. J.

A NEW SMALL GAS ENGINE
A new small engine suitable for power lawn mowers, water systems, compressors, paint spray rigs and other small power machinery, has recently been put on the market by the Lauson Corp., 11 Jackson St., New Holstein, Wis., and is described in literature which may be secured on application.

TRANSPORTING READY-MIXED CONCRETE
Bulletin No. 24 issued by Norris K. Davis, Inc., 400 Seventh St., San Francisco, Calif., describes the Davis concrete transfer system for mixing concrete and transporting it in good condition to the job.

COMMERCIAL CONCRETE PLANTS
Bulletin No. 190 of the Butler Bin Co., Waukesha, Wis., describes Butler commercial concrete plants for the wet batch method and Bulletin No. 180 describes plants for the mixed-in-transit method, both of which will be of interest to contractors and others engaged in concrete work.

EXPLOSIVES AND THEIR USES
The du Pont Explosives Service Bulletin contains a table of brands of du Pont Explosives and the uses to which they are best adapted compiled by the Technical Section, Explosives Dept., E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

TRUCKS ON CONTRACTING JOBS
Bulletin A-513-T of the International Harvester Co. of America, 606 South Michigan Ave., Chicago, Ill., is a 32-page booklet illustrating and describing various large jobs on which International Harvester speed and heavy-duty trucks have been used, devoting one page to a large picture and short description of each job.

You Can't Afford to Be Without a

BERG
HI-WAY SURFACER

When you consider how much better and faster it surfaces concrete and concrete-asphalt roads—how much time, labor and money it actually saves—you can't afford to be without the BERG. It does the work of ten men. No tool or method like it for cutting down high spots, surface irregularities, uneven expansion joints and repaired patches. Used and endorsed by leading road builders, State highway commissions and municipalities. Write for complete details and prices.

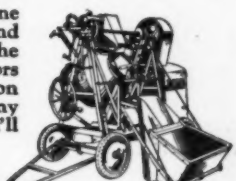
THE CONCRETE SURFACING MACHINERY CO.
4559 Spring Grove Avenue
Cincinnati, Ohio

Distributors in principal cities

The BERG tool head is driven by an air-cooled gas engine. Costs only a dollar a day for gas and oil.

Saving only *Starts* with the Price

YOU can't beat this genuine Jaeger trailer as a "buy". And it's even harder to beat it on the job, mixing concrete. Contractors say there's a Jaeger 3½S trailer on every street in town. Talk to any man who owns one and you'll know why.



NON-TILTERS 7, 10, 14, 21, 28, 56S sizes. Ask about 1-bag Speed King trailer.

TILTERS—with Skip Shaker loader and Dual-Mix drum. Sizes 3½, 5, 7, 10 ft.

Send for Catalog, Prices, Terms.

THE JAEGER MACHINE CO.
701 Dublin Ave. Columbus, Ohio

Asphalt Heater with Elevated Melting Chamber

MANY advantages are claimed for the Hotstuf asphalt heater with the patented elevated melting chamber, made by the Mohawk Asphalt Heater Co., 60 Weaver St., Schenectady, N. Y. The cold material is melted in a separate elevated melting chamber and intense heat is circulated directly under this chamber and then indirectly down and under the lower storage chamber, thus providing for greater heat absorption. The indirect heat circulation produces an oven effect, holding the intense heat long enough to penetrate and utilize 30 to 50 per cent more heat units than is usually possible. The elevated melting chamber is separated from the lower storage chamber by a solid removable partition plate with an opening at the bottom, so that the cold material is distinctly separated from the hot material and it is possible to reload with cold material without cooling that which has already been melted.

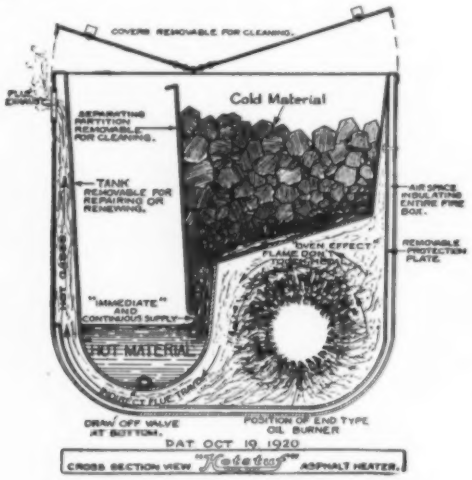

COVERS REMOVABLE FOR CLEANING.
FLUE EXHAUST
SEPARATING PARTITION REMOVABLE FOR CLEANING.
Cold Material
TANK REMOVABLE FOR REPAIRING OR RENEWING.
AIR SPACE INSULATING ENTIRE FIRE BOX.
REMOVABLE PROTECTION PLATE.
"OVEN EFFECT" FLAME DOES NOT TOUCH METAL
"IMMEDIATE" AND CONTINUOUS SUPPLY
HOT MATERIAL
DIRECT FLUE TRAP
DRAW OFF VALVE AT BOTTOM.
POSITION OF END TYPE OIL BURNER
PAT. OCT. 19, 1920
CROSS SECTION VIEW OF Ketetum ASPHALT HEATER.

Diagram of the Melting Chamber of the New Asphalt Heater

This construction practically eliminates coking by the natural flow of the hot material carrying the sediment to the storage chamber where it is gradually carried off through the drawoff valve. This process of melting and the temperature control eliminates danger of over-heating and of destroying the life of the material.

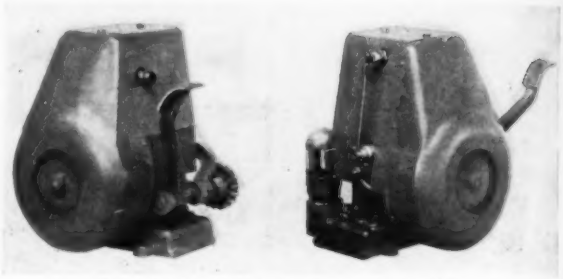
Due to the position of the burner, the flame does not come into direct contact with the metal, thereby practically eliminating the danger of burning out the inner tank. The entire bottom and walls of the fire box are insulated by separate lining plates forming a 1-inch air space.

A New Small Gas Engine

A NEW small engine suitable for power lawn mowers, water systems, compressors, paint spray rigs and other small power machinery, has recently been put on the market by the Lauson Corp., 11 Jackson St., New Holstein, Wis.

This new RA gas motor is fully enclosed, and has a positive visible oiling system which requires no pump, the vacuum being produced by the pistons utilized to circulate the oil. The oil supply is held in a glass bottle which is always visible and may be easily removed and replenished.

A push with the foot on the treadle spins the motor, while the specially designed magneto provides a spark more than ample for the work. The engine develops ¼-horsepower at 1,800 rpm.



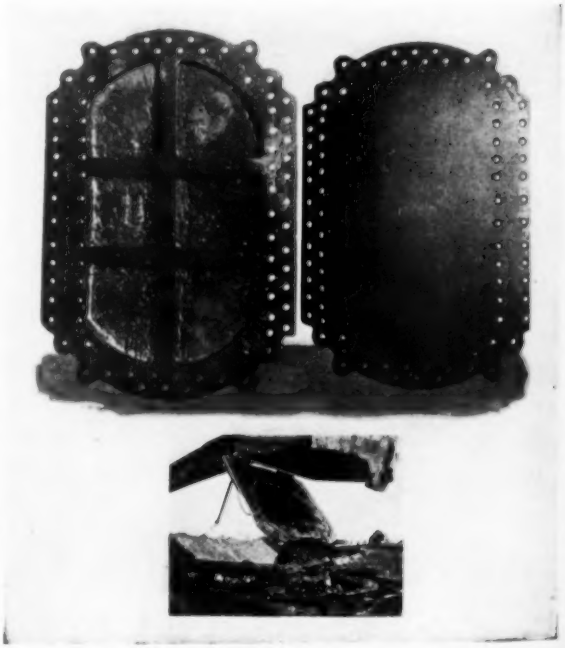
Lauson ½ to ¾-horsepower RA Engine

The engine can be arranged so that power can be taken off at either end of the crankshaft by means of a pulley and V-belt or gear drive. A fly-ball governor on the end of the camshaft operates on the governor valve without external springs. A wide speed range is afforded by adjusting the knurled nut protruding from the valve body.

A Reinforcement Unit for Dipper Doors

A NEW type of dipper door reinforcement casting has recently been placed on the market by the American Manganese Steel Co., Chicago Heights, Ill. This casting, made of Amsco manganese steel, can be applied to any dipper door that is flat inside and that has not become distorted. The Meyer Turtle Back, a patent for which has been applied for, is convex to the work and of ample size and strength to protect the door and mechanism from severe shock and distortion.

This turtle back is designed to reduce wear and eliminate the bothersome door and latch troubles caused by falling rocks, the shock from which permanently distorts door sheets. It is made to suit all dipper sizes and is quickly and easily secured to the inside of the door so as not to interfere with door braces and latch mechanisms.



The New Amsco Turtle Back to Protect Dipper Doors from Damage

Do you check over this list each month? Get the Habit. It will save you money to be up-to-date on equipment

ASPHALT HEATER WITH ELEVATED MELTING CHAMBER
Literature describing the Hotstuf asphalt heater with the patented elevating melting chamber and telling its many advantages may be secured without obligation on application to the Mohawk Asphalt Heater Co., 60 Weaver St., Schenectady, N. Y.

A NEW SIZED PORTABLE AIR HOIST
Complete information in regard to the new sized Utility portable air hoist of 2,000-pound capacity for use on derricks for hoisting buckets, for caisson work, pulling cars, skidding timbers, handling pipe, operating clamshell or orangepeel buckets, hoisting material, pulling sheet piling, driving piles and similar work may be secured from Ingersoll-Rand Co., 11 Broadway, New York.

TAR KETTLES WITH DUAL PNEUMATICS
Bulletin E-14 of Littleford Bros., 485 E. Pearl St., Cincinnati, Ohio, tells all about the Littleford No. 97 supply tank, which is now furnished mounted on a new trailer with dual pneumatic rubber tires with a reversible steer feature.

REINFORCEMENT UNIT FOR DIPPER DOORS
Complete data regarding the new type of Amsco manganese steel dipper door reinforcement casting recently placed on the market by the American Manganese Steel Co., Chicago Heights, Ill., may be secured on request.

NEW CATALOG COVERS COMPLETE LINE
For the first time the entire line of Barber-Greene material handling machinery which covers every field from pipe line trenching to pouring concrete on building projects, has been covered in a single 32-page catalog, handsomely printed and covered in black which devotes one page to each machine and contains a large posed photograph, a brief description and general specifications and features. Copies of this book, The Barber-Greene Line, may be secured on request from the Barber-Greene Co., 485 West Park Ave., Aurora, Ill.

A SMALL FOUR-WHEEL DRIVE SHOVEL TRUCK
Small enough to work inside a box car and yet able to dig and carry one-ton loads, is the new electric four-wheel drive shovel truck for handling bulk materials, recently added to the line of material handling equipment of the Terminal Engineering Co., 17 Battery Pl., New York, who will be pleased to send full data on request.

A NEW PORTABLE HOIST
Details, specifications and measurements of the new Trackson Model HC portable hoist which is adapted to mounting on the Case Model CI industrial and Model C agricultural tractors, are given in Circular No. 246 which may be obtained by writing the Trackson Co., 1323 South First St., Milwaukee, Wis.

BRONZE VALVES
The new Bulletin No. 141 which fully describes and illustrates Jenkins standard bronze valves with the one-piece screw-over bonnet and slip-on stay-on disc holder and which are made in globe, angle, cross and check types for all standard services, has just been announced by Jenkins Bros., 80 White St., New York.

ELECTRICALLY DRIVEN CAISSON PUMPS
A folder, Leaflet CP-350, recently issued by Yeomans Bros. Co., 1433 Dayton St., Chicago, Ill., describes Yeomans electrically driven caisson pumps which are compact, light weight, have long life bearings, the motors for which can be changed on the job, parts are easily replaced and have other advantages.

A BULLDOZER FOR BIG TRACTORS
A bulldozer blade 48 inches high, 10 feet wide and attached to the tractor so that the overall length of both tractor and bulldozer is 15 feet 2 inches, has been announced by the Essex Engine & Machine Corp., Belleville, N. J., who will be pleased to send complete data on request.

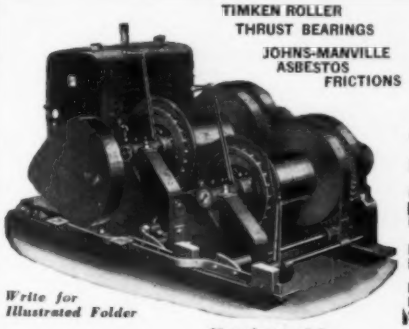
CONCRETE ACCELERATOR AND HARDENER
An integral liquid compound to assist contractors in making better concrete is described in literature which may be secured from Acqua-Pruf, Inc., 393 Seventh Avenue, New York City.

SELF-LOADING SCRAPERS
Baker-Maney self-loading scrapers, which have been continually improved and which are known as dependable earth movers, are described in bulletins which may be secured upon request from the Baker Manufacturing Co., 585 Stanford Avenue, Springfield, Ill.

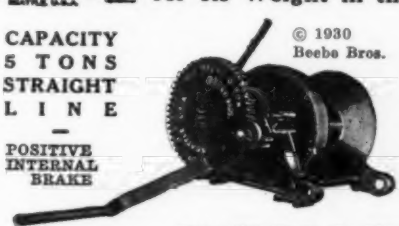
RE-TREAD ROAD CONSTRUCTION
The method of re-tread construction and maintenance providing wider, smoother, and safer roads is described in the literature of the Barrett Co., 42 Rector Street, New York City.

HYDRAULIC BULLDOZER
Apsco hydraulic bulldozers for use with Caterpillar tractors are described in a well illustrated bulletin No. 230, which will be sent promptly to any contractor interested, by the American Tractor Equipment Co., 5301 Orchard Street, Oakland, Calif.

A 5-TON CAPACITY HAND HOIST
The Beebe hand hoist known as "The Strongest Geared Power for Its Weight in the World" is described in a circular which may be secured from Beebe Brothers, 3219 First Avenue, South, Seattle, Wash.

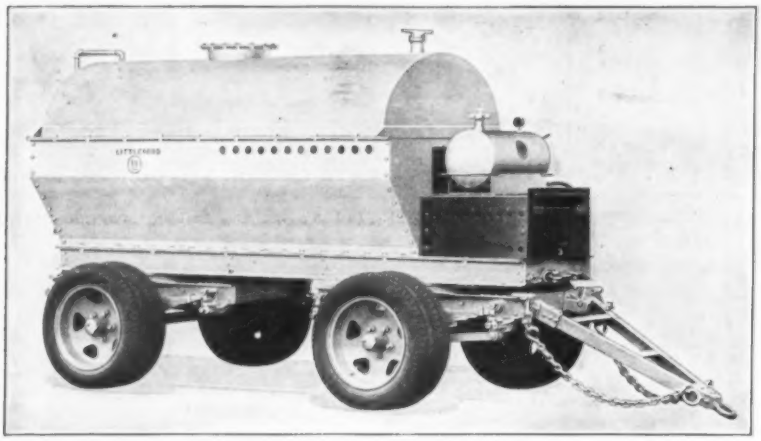

TIMKEN ROLLER THRUST BEARINGS
JOHNS-MANVILLE ASBESTOS FRICTIONS
ALEMITE-ZERK LUBRICATION
HIGH CARBON GROUND PRECISION SHAFTING AND IMPROVED SCREW THRUST WITH POSITIVE CLUTCH RELEASE
LINE PULL 2300 LBS.
LINE SPEED 180 TO 280 FT PER MINUTE
Write for Illustrated Folder
Manufactured by
STERLING MACHINERY CORPORATION
2305 Holmes St. Kansas City, Mo.

Having four types . . . Orange Peel, Clam Shell, Electric Motor, and Drag Line . . . of digging and rehandling buckets to draw from, makes a Hayward recommendation absolutely unbiased.
THE HAYWARD CO.
32-36 Dey St. New York, N. Y.
Hayward Buckets

"The Strongest Geared Power for Its Weight in the World"
CAPACITY 5 TONS STRAIGHT LINE
POSITIVE INTERNAL BRAKE

© 1930 Beebe Bros.
Weight 110-lbs.
Size 16x17x13-in. high
Two Speeds 4 to 1 24 to 1
Write for descriptive circular with user's endorsements and name of nearest dealer.
Price $80 F. O. B., Warehouse Points Chicago, Brooklyn, New Orleans, Houston
Dealers in Principal Cities
BEEBE BROS.
3219 First Ave., So. Seattle, Wash.

Simplex Jacks

for Industries-Utilities-Railways-Oil Wells-Mines-Engineering-Contractors-
Simplex Lever Jacks-Pipe Pushers-Trench Braces-
Simplex Screw Jacks-with the Visible Screw-
Distinctive in Man Power, Safety & Simplicity
Templeton, Kenly & Co., Chicago, U.S.A.
The World's Largest Manufacturers of Jacks
Baldwin Locomotive Works, Foreign Representative
Simplex Screw Jack with the Visible Screw



Littleford Tar Kettle with Dual Pneumatic Tires

Tar Kettles With Dual Pneumatic Tires

A NEW mounting for its No. 97 distributor supply tank has been brought out by Littleford Bros., 485 East Pearl St., Cincinnati, Ohio. This new trailer is equipped with dual pneumatic rubber tires and is of the reversible steer type. The drawbar may be detached and hooked onto the other end of the trailer to pull it in the opposite direction.

A New Small Vertical Boom Ditcher

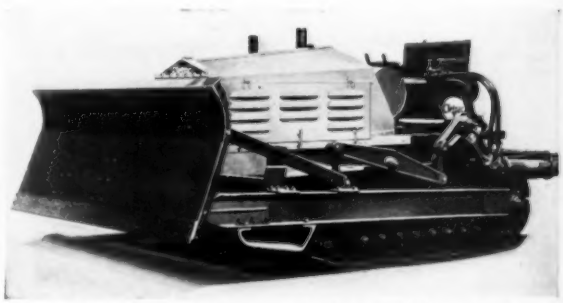
A VERTICAL boom ditcher that is only 4 feet wide and 11 feet 6 inches long, which is no higher than a tall man's head when digging and which will dig a trench from 5 inches to 8 inches wide and from zero to 3 feet deep at varying speeds from 15 inches to 12 feet a minute has been announced by the Barber-Greene Co., 485 West Park Ave., Aurora, Ill.

The Service Special ditcher has all the features of the big Barber-Greene machines, and is crawler mounted. It has the vertical boom which allows it to dig right up to a sidewalk or curb, ending the trench flush, and to cut a square corner. As an insurance against strains caused by striking underground obstacles and as a protection to any underground pipes, the machine is equipped with the standard B-G overload release sprocket, a device that automatically stops the bucket line without injuring anything or killing the engine. The construction is such that at every half revolution, it exerts a pull on the bucket line before slipping again, and if the operator desires, he can keep the buckets pounding at the obstacle until it is cut through.

The buckets clean themselves automatically, even in very sticky material. Attached to the boom is a telescopic follow-up scraper which insures a clean trench. The boom is raised by power, making it possible for the operator to dig accurately to grade at all times.

The traveling speeds of this ditcher are 2 miles and 1⅓ miles per hour. Its speed, small size and crawler mounting make it highly maneuverable and able to go places and do things that would be impossible for a big ditcher. Although a light machine, it is built of heavy structural steel and powered by a 33-bhp 4-cylinder Buda gasoline engine.

The New Barber-Greene Service Special Ditcher



A Cletrac 80-60 Tractor Equipped with a 7,000-Pound Essex Hydraulic Bulldozer

'A Bulldozer for Big Tractors

A BULLDOZER blade 48 inches high, 10 feet wide and attached to the tractor so that the overall length of both tractor and bulldozer is 15 feet 2 inches, has been announced by the Essex Engine & Machine Corp., Belleville, N. J., for use with the Cletrac tractor. The approximate weight of the bulldozer is 7,000 pounds. This combination of tractor and bulldozer is a widely used unit among contractors and road builders for spreading, leveling and dirt moving.

Additions to Line of Dump Trucks

FIVE dump body trucks were recently added to the line of standard Model AA 1½-ton trucks made by the Ford Motor Co., Detroit, Mich. These trucks are designed to meet the requirements of most kinds of hauling in which this type of body is used and offer a wide range as to hoisting method and capacity.

The Ford dump trucks include a hydraulic dump body with a hoist of 1½ tons normal operating capacity, a heavy duty hydraulic dump body, a mechanical dump body, a gravity dump body and hand dump body. The bodies are made of one piece of steel with no center or bottom seams to interfere with the free flow of materials.

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ALL TYPES OF ROAD ROLLERS
Buffalo-Springfield road rollers built in every practical weight and size, steam and motor driven, three wheel and tandem, with scarifier and other attachments, are described in an illustrated booklet distributed by the Buffalo-Springfield Roller Co., Springfield, Ohio.

A PRACTICAL CAR UNLOADER
The Burch car unloader which is a plain, substantially built mechanism made to save contractors' money and do the job well is described in the literature of the Burch Corp., Crestline, Ohio.

CURING CONCRETE WITH CALCIUM CHLORIDE
Booklet 442 issued by the Calcium Chloride Publicity Committee tells of the use of calcium chloride as an admixture or spread on the surface of concrete for curing. Copies of this booklet can be secured from the Columbia Products Co., Barberton, Ohio, the Dow Chemical Co., Midland, Michigan, or the Solvay Sales Corp., 61 Broadway, New York.

LOW COST COMPRESSED AIR
Buhl portable air compressors with many advanced features resulting in the low cost of air and freedom from annoying and costly shutdowns, are described in the literature of the Buhl Co., Old Colony Building, Chicago, Ill.

EXPANSION JOINTS OF ASPHALT-SATURATED FELT
The Carey Elastite expansion joint which is made of a special asphaltic compound, sandwiched at high pressure between layers of asphalt-saturated felt and which does not run at high temperatures nor become brittle at zero, is described in the literature of the Philip Carey Co., Lockland, Cincinnati, Ohio.

PORTABLE AND STATIONARY BELT CONVEYORS
The descriptive bulletins of the Chicago Automatic Conveyor Co., 1853 South 55th Street, Cicero, Ill., illustrate and describe in detail the portable and stationary belt conveyors, bucket elevators and screens manufactured by this company.

TRACTORS FOR HEAVY LOADS
The bulletins of the Cleveland Tractor Co., 19321 Euclid Avenue, Cleveland, Ohio, describe each size of Cletrac and tells of the power job it is most capable of handling in highway, contract, and industrial work. Cletracs are built with broad steel tracks to securely grip the ground in bad footings and on steep grades.

DEPENDABLE POWER FOR CONSTRUCTIVE EQUIPMENT
The specialized effort and centralized responsibility for the construction of Continental motors in the past 29 years has developed a complete series of gasoline power plants for the various fields of construction equipment. Full details can be secured from Continental Motors Corp., Detroit, Mich.

HOISTS BUILT ESPECIALLY FOR CONTRACTORS
Portability, a prime essential for a profit-making hoist, an electric-welded steel frame providing great strength coupled with unusual lightness of weight are featured in Dake hoists. The latest catalog issued by the Dake Engine Co., Grand Haven, Mich., describes these hoists in detail.

MAKING CAST IRON PIPE JOINTS WITH A WRENCH
The feature of Universal cast iron pipe which requires no bell hole nor calking as the joints are made up with bolts and wrenches is described in detail in literature issued by the Central Foundry Co., 420 Lexington Avenue, New York.

RED LANTERNS FOR CONSTRUCTION BARRICADES
Dietz red lanterns, which afford protection to contracting interests and the motoring public when displayed along side of trenches or on piles of material necessarily stored on highways, give definite warning. A catalog of Dietz lanterns may be secured from the R. E. Dietz Co., New York.

NO FOOT-VALVES FOR THIS PUMP
The Homelite portable centrifugal pump which weighs only 90 pounds and which is self-priming, requiring no foot valve, and powered by a 1½-horsepower air-cooled gasoline engine, is described completely in the literature of the Homelite Corp., 71 Riverdale Avenue, Port Chester, N. Y.

PROTECTIVE LUBRICANTS
Dixon's waterproof graphite grease which contains graphite as an element, giving wearing surfaces a remarkable smoothness and protecting them, is described with all the facts regarding its use in Circular 86-W which may be secured with free samples from the Joseph Dixon Crucible Co., Jersey City, N. J.

THE USE OF CORRUGATED CULVERTS
Genuine open hearth iron corrugated culverts for highway drainage, airports, storm sewers, railway roadbed drainage, real estate developments, golf courses, drainage of reclaimed areas, and for temporary or permanent flumes, and for reservoir syphons and outlets are described in detail in the literature of the Gohi Culvert Manufacturers, Inc., Newport, Ky.

FOUR AND SIX-CYLINDER GAS ENGINES FOR CONSTRUCTION EQUIPMENT
Hercules engines which are built in a complete line of four and six-cylinder models ranging in size from 9 to 175 horsepower and are adapted for a wide variety of heavy-duty construction equipment are described completely in the literature of the Hercules Motors Corp., Canton, Ohio.

A NEW OIL BURNING TAR HEATER
Honhorst tar heaters, and particularly the new oil burning heater, are described in pamphlet No. 15 which may be secured from the Jos. Honhorst Co., 1016 W. 6th Street, Cincinnati, Ohio.

ACQUA-PRUF

THE NEW

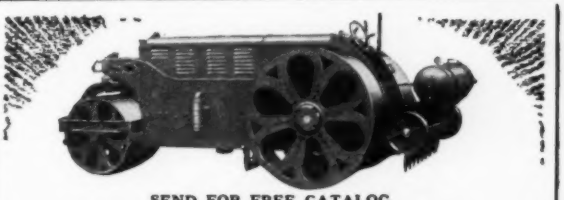
Concrete Accelerator and Hardener

An integral liquid compound to assist contractors in making better concrete. Acqua-Pruf is a compound that has an affinity for portland cement. One quart to the bag is the standard proportion that has by test produced a compressive strength 50% in excess of untreated concrete. This enables walks, paving, etc., to be opened to traffic in 24 hours.

Acqua-Pruf treated concrete can be poured at temperatures as low as 10 degrees above zero.

The manufacturers guarantee that Acqua-Pruf contains no acids or other elements in a form that will attack reinforcing.

ACQUA-PRUF, INC.,
393 Seventh Ave. New York City



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330 East Center St., Marion, Ohio

HUBER
MOTOR ROLLERS

The NATIONAL CARBIDE V. G. LIGHT

Gives you daylight conditions on night jobs.
Spreads a full, even beam of about 8000 candlepower right where you need it.
Lights up the job for about nine hours on one 5-pound charge of National 14-ND Carbide and 5 gallons of water.

Is easily handled by one man; has nothing to get out of order; no harm done if it tips over—just stand it up again, and it goes right on working.

Weight 30 pounds empty; 75 pounds when full.

Write for Catalogs on V-G Light, V-G Handy Light and Lantern

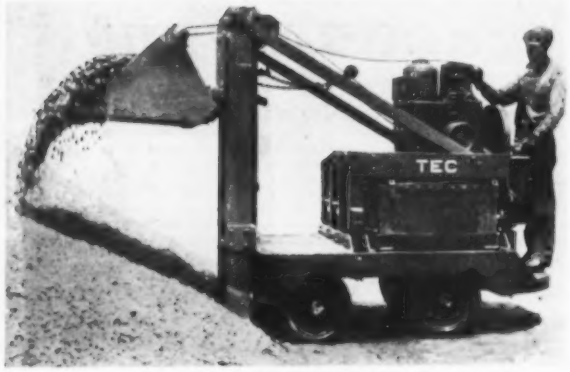
NATIONAL CARBIDE SALES CORP.
LINCOLN BLDG. NEW YORK
Opposite Grand Central

Handling Large Yardage on Long Hauls

Write for 96-page illustrated catalog

With a Sauerman Power Drag Scraper one man can excavate from 100 to 4,000 cu. yd. of earth or gravel per day and move this material to a hopper or pile. Pit crew and expensive haulage equipment both are eliminated. Sauerman machine costs less to install and operate than any excavator-conveyor of equal capacity.

Sauerman Bros., Inc.
464 S. Clinton Street
CHICAGO



The New TEC Electric Shovel

A Small Four-Wheel Drive Shovel Truck

SMALL enough to work inside a box car and yet able to dig and carry one-ton loads, is the new electric four-wheel-drive shovel truck for handling bulk materials recently added to its line of material-handling equipment by the Terminal Engineering Co., 17 Battery Pl., New York.

This shovel is capable of unloading a box car every hour, carrying its loads to almost any desired place, either indoors or outdoors. Ruggedness is an important feature of these machines as they must be able to run into piles of crushed stone, scrap metal, etc., lift out a bucketful and then carry the load over rough ground to the dumping place. Because of their 4-wheel drive with separate motor for each wheel, these machines have the necessary traction for pushing their shovels into a pile and for work in slippery places, on cinder fill yards, sand or snow. Their traveling speed is faster than is usual on industrial trucks, being 10 miles per hour empty and 8 miles per hour loaded.

As the loads are all carried in an overhung position, a maximum counterbalance is obtained by locating the battery, hoist, etc., as far away from the load as possible at the opposite end of the frame.

In designing the new shovel trucks, the manufacturers have given thought to the standardization of parts. The chassis is the same as used on the Model BC-36 heavy duty crane and, if desired, the elevating structure can be replaced in a very short time with a crane boom. All the main functioning units, such as wheels, battery, motors, steering, braking, hoisting, etc., are interchangeable with those of all models of TEC equipment.

The shovel buckets are made in various widths for handling materials of different specific gravities. A single hoist unit controls all the functions of the bucket and an automatic stop on the upstroke speeds up the operations on short haul work and acts as a safeguard. The uprights on which the shovel carriage runs, may be built to any desired height.

The turning radius is exceptionally short as all four wheels steer. The truck turns about a point only 2 inches from the side of the truck, midway between the axles and is able to do this short turning because each wheel is driven by a separate motor. The shovel is operated from a storage battery which is in a steel compartment placed over the wheels at the driver's end to act as a counterbalance. There are two set of brakes, mechanical brakes on two wheels and electrical brakes on all four wheels, operating independently from the foot pedal and speed controller, respectively. The operator's hands are always protected from injury because all controls are within the outer edges of the truck at all times, the steering being done by a wheel, rather than a handlebar.

A High Speed Rubber Crawler for One-Man Graders

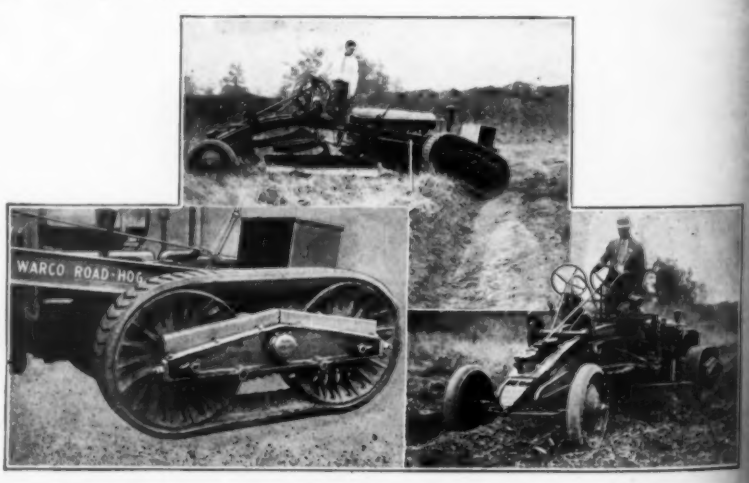
AFTER much preliminary planning and investigation the W. A. Riddell Co., Bucyrus, Ohio, has placed on the market the Model TR rubber crawler designed for use on tractors and power graders. While the rubber crawler, as such, is not exactly new, it being first introduced at the Atlantic City Road Show in January, 1930, it offers many new features.

In the first place this crawler has the same characteristics as other Warco rear-type steel crawlers. It is interchangeable with either the steel crawler or with rubber tired wheels on the same tractor axle and each crawler is free to operate on the axle independently. This relieves the tractor and grader frame of many strains when passing over irregular surfaces.

Another feature is that it drives both the front and rear idler wheels, making it possible to run either forward or backward with equal facility. The driving chain is of the continuous roller type of high grade and ample strength. Driving both wheels halves the strain on the driving chain, increases the life of the rubber tread by eliminating most of the pull from the bottom run and doubles the traction. The idler wheels are both adjustable and are held in tension by udylite plate rust-proof bolts. The chain sprockets are machine cut, case hardened and riveted to the hubs. The idler wheels and drive sprocket hub bearing are roller-bearing-mounted and effectively sealed against dirt. The rubber tread is of standard make manufactured by the Goodyear Tire & Rubber Co. of Akron, Ohio.

The normal area of ground contact is 800 square inches with a normal ground pressure of 5.7 pounds per square inch when mounted on a standard Model E grader with McCormick-Deering industrial model 20 tractor.

The Warco Model TR rubber crawler is now available for the industrial Model 20 McCormick-Deering tractor and will soon be available for application to Fordson, Case and Allis-Chalmers tractors.



One-Man Graders Equipped with the New Warco High Speed Rubber Crawlers

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